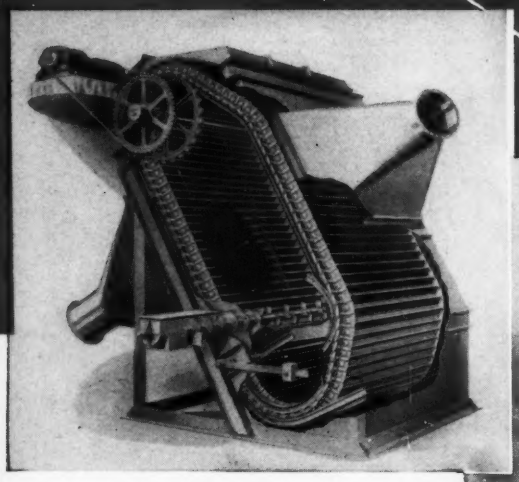
Mining CONGRESS JOURNAL

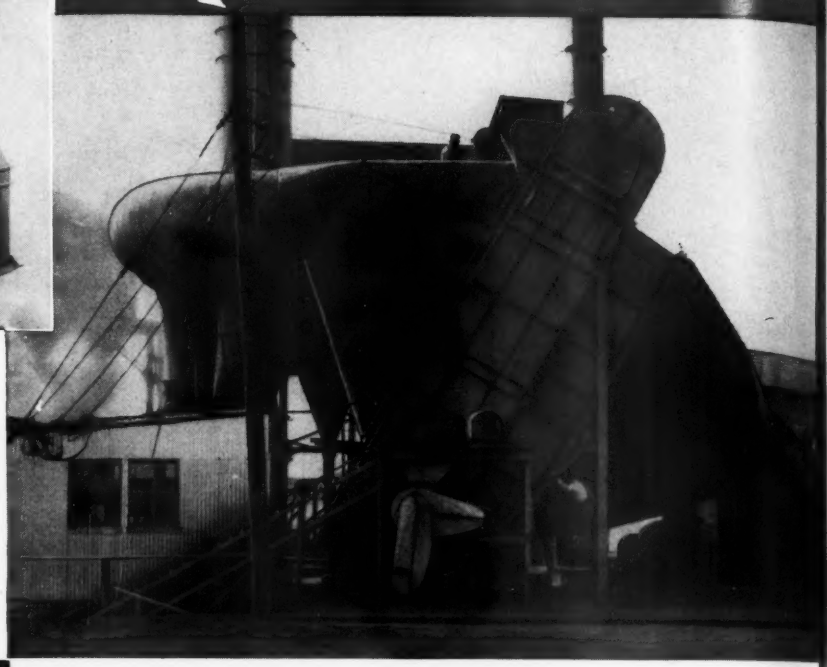
AMERICAN MINING CONGRESS

AMC

MAY
1950

HEAT DRYING FINE COAL at a Profit!





At a Southern Illinois mine, this Link-Belt drying plant (right) was built especially to recover and convert sludge, that formerly had been wasted, into powdered fuel for utility power plants. The Multi-Louvre Dryer (above) handles 35 tons per hour, and reduces surface moisture from 12% to 1% — AT A PROFIT.

A few Typical Installations

- **SOUTHERN ILLINOIS**
  35 T.P.H. of ¼" x 0" handled in a single unit, reducing total moisture from 20% to 9%.
- **EASTERN KENTUCKY**
  Two units handle a total of 110 T.P.H. of ¼" x 0". Moisture reduced from 15% to 3%.
- **WEST VIRGINIA**
  Two units, each with a capacity of 36 T.P.H., dry ⅜" x 0" coal. Moisture reduction from 8% to 3½%.
- **EASTERN KENTUCKY**
  Two units handle 38 T.P.H. in each dryer. 16% moisture reduced to 3%.

Excellent Results on Many Types of Coal

The Multi-Louvre Dryer design permits flow of drying gases through the system at low velocities, resulting in low power requirements and minimum degradation. Often it is practical to use the fines from dust collectors as fuel for the dryer furnace.

Link-Belt engineers can be helpful in solving your drying problems — regardless of coal seam or particle size — whether for recovery of waste, or as part of new or existing plants. Ask them — and ask for Book No. 2209.

LINK-BELT COMPANY 11,015

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8.

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered and Built *by* LINK-BELT

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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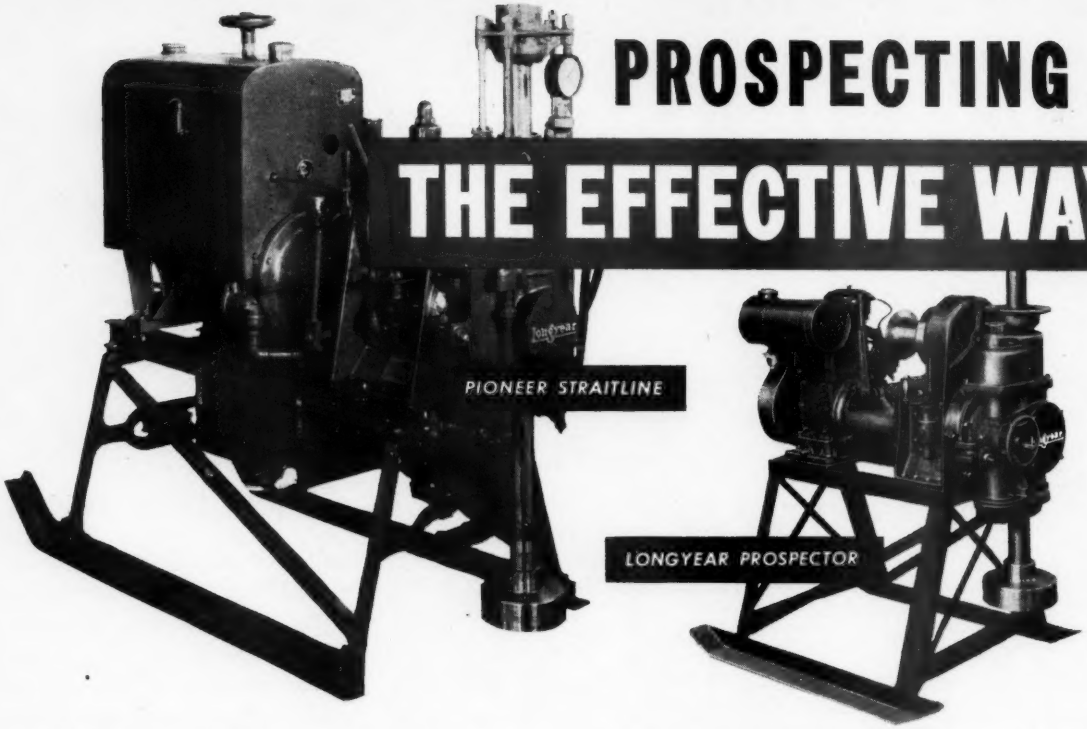
ABC
Member Audit Bureau of Circulations

PROSPECTING..
THE EFFECTIVE WAY



YOUR BEST METHOD is core drilling. A given area may be rapidly and economically tested, core samples recovered, mineral values determined . . . Cores tell the story!

YOUR BEST DRILLS for shallow to moderate depth drilling are the Longyear Prospector and Pioneer Straitline. Their practical advantages include:

- MOBILITY—Conveniently transported to remote districts by plane, or "broken-down" for pack horse or canoe. They are easy to move in the field.
- DEPENDABILITY—Design and sturdy construction assures continuous, trouble-free operation. That means more feet per shift.
- ECONOMY—Fuel consumption and operating costs are low. Reduced diamond loss results from smooth power-flow to bit.

YOUR CHOICE OF PROSPECTOR OR PIONEER DEPENDS ON DRILLING CAPACITY REQUIRED

DRILL CAPACITIES—The depth of holes to be drilled will govern largely the selection of your drill. The Longyear Prospector, capacity 300′ of ⅞″ core, and the Longyear Pioneer Straitline, capacity 600′ of ⅞″ core, are illustrated and fully described in bulletins No. 73 and No. 69 respectively. Write for them.

CORE DRILLS AND SUPPLIES—Longyear manufactures a complete line of core drills—large or small, for surface or underground use. There is a quality-built model to suit your job.

Also, quality-built diamond drill accessories and standard supplies are available from stock.

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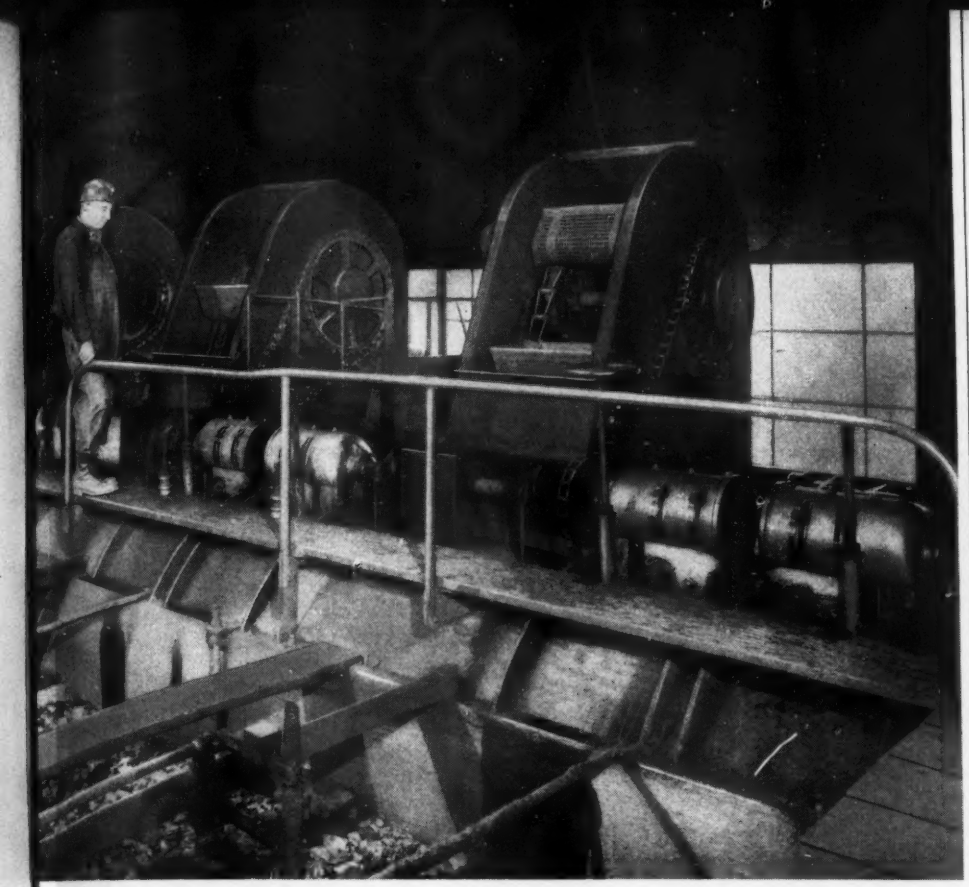
CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES



Coal washer gets clean bill of health with . . .

AT A LARGE midwest mine, operators tried a conventional grease on the air valves of a coal washer. These valves control air flow used to agitate and separate coal from refuse. The grease did not seal the control valves against air leakage. Resulting loss of pressure threw air pulsations off beat, caused uneven operation and poor separation of refuse from the coal. Grease consumption ran high.

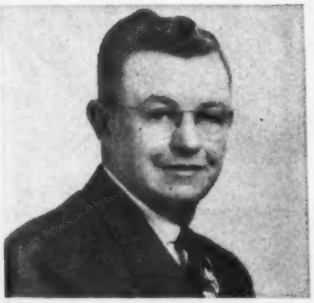
The washer was switched to a SUPERLA Grease recommended by a Standard Oil lubrication specialist. *This lubricant took the job in stride.* It prevented air leakage, kept bearing surfaces well lubricated. Throughout nine years of service it has kept valves in top working order and in excellent condition. Efficient separation of refuse from the coal has been the result.

A lot of tough lubricating jobs in your mine can be turned over to SUPERLA Greases. They will give you results comparable to what you can get with the highest type of special greases. They will prove as readily available and economical as ordinary cup greases.

SUPERLA
REG. U. S. PAT. OFF.
Greases

Discuss the advantages of SUPERLA Grease with a Standard Oil lubrication specialist. His headquarters are near your mine. How you can benefit from his services is explained at the right. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?



J. A. Grieve, lubrication specialist at Standard Oil's Decatur office, helped this midwest mine make important savings with SUPERLA Grease. He was close at hand, gave operators engineering service when they needed it.

There's a corps of Standard Oil lubrication specialists throughout the Midwest. You'll find one located near your mine. Through special training and a lot of practical experience, this man has gained a working knowledge of lubrication that can mean real savings for you. To obtain his services, simply contact the nearest Standard Oil (Indiana) office. Discuss with him the savings you can make with such outstanding products as:

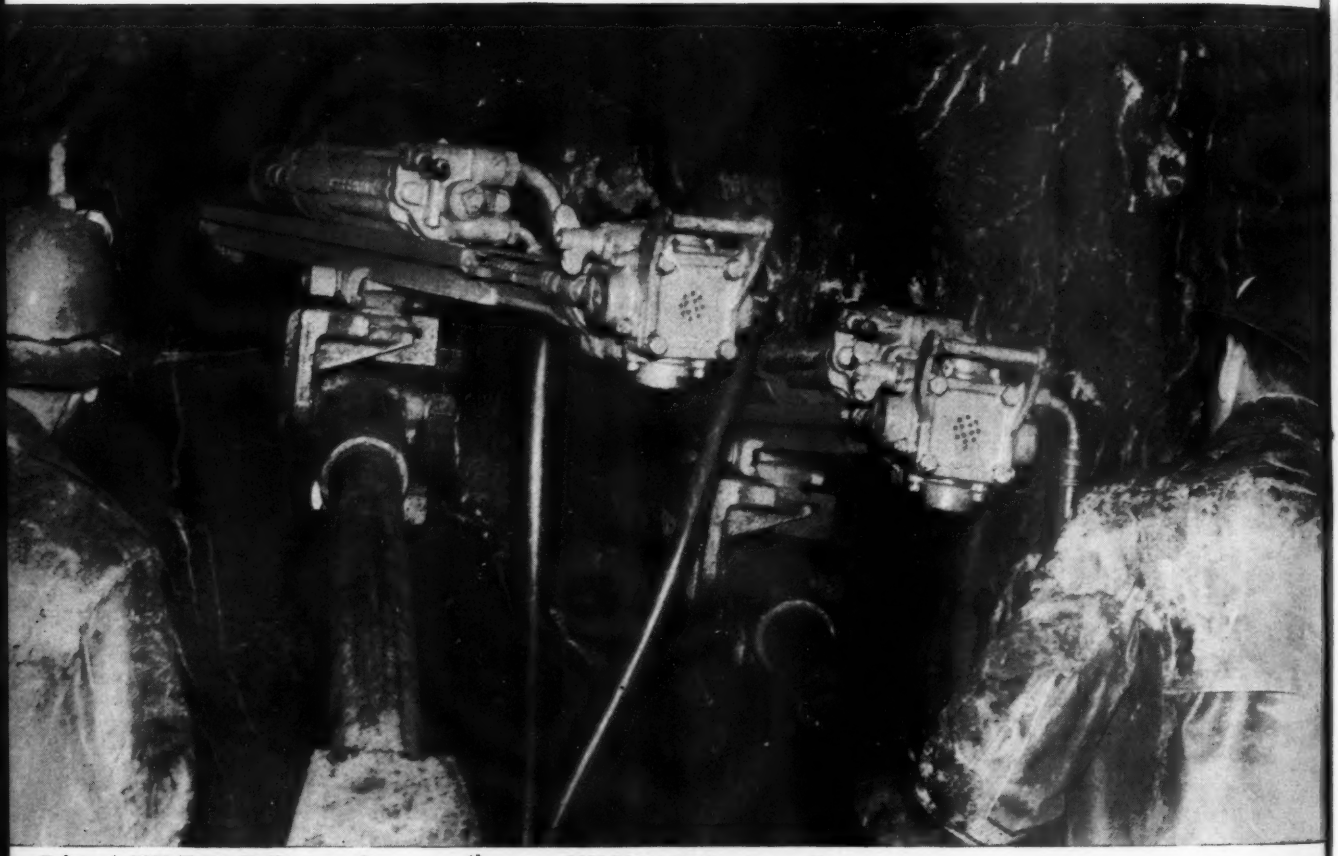
STANOIL Industrial Oils—Here's *one* line of oils that provides cleaner operation of loader and crane hydraulic units; supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Mine Lubricants—These new, improved oils and greases provide better lubrication of cutters, loaders, locomotives, mine cars, and other underground equipment. They eliminate transmission-case deposits, reduce clutch-plate gumming, and minimize wear on gears and bearings.

CALUMET Viscous Lubricants—On open gears and wire rope, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

STANDARD OIL COMPANY (INDIANA) STANDARD

Only JOY



Above, two JOY T-350 Drifters mounted on JOY Hydro Drill Jibs.

Below, a JOY T-300 Drifter on column mounting in a small heading.

There's a Complete Line of JOY SILVER STREAK STOPERS with DUAL VALVE, CADMIUM PLATING, and the safe THUMB-FLIP rotation control.

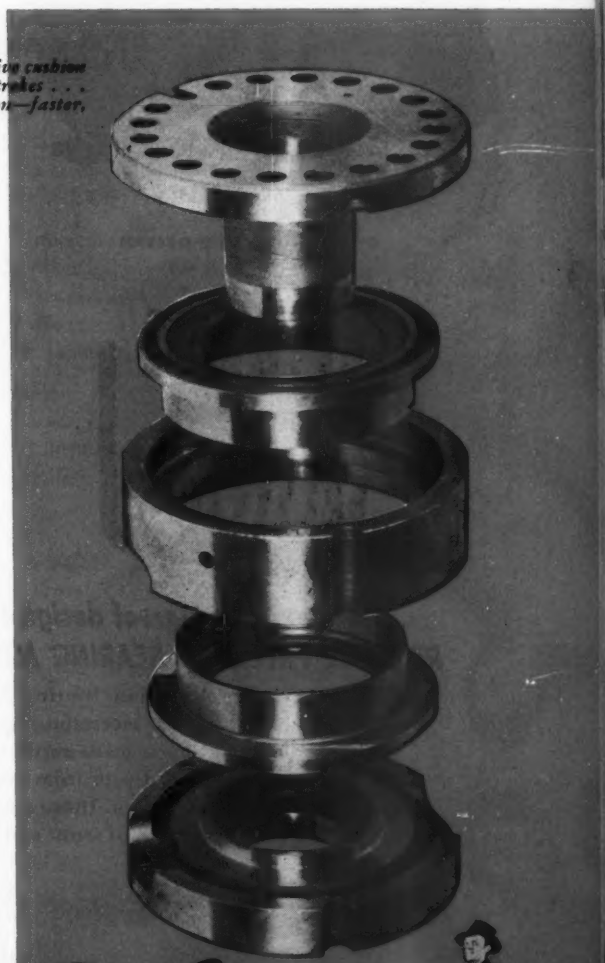
Use JOY SULMET BITS—tungsten carbide tipped for longer life, and for more footage with fewer bit changes.

SILVER STREAK

ROCK DRILLS

have the DUAL VALVE that makes air do more work!

The JOY Dual Valve gives positive cushion control on both up and down strokes . . . produces powerful piston action—faster, harder punch.



Other exclusive cost-saving features of JOY DRIFTERS:

- CADMIUM PLATING inside and out—inhibits rust, prevents scoring during run-in, increases power by permitting closer piston tolerances, adds to service life of drill.
- PISTONMOTOR FEED—gives smooth, steady advance and safe retraction.
- LOCKING CHUCK with greater bearing area—increases life of chuck parts and drill steel.
- AUTOMATIC DRILL STEEL CENTRALIZER—spots holes safely, easily, accurately.

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The *Safe* Choice for Hazardous Locations

. . . RELIANCE EXPLOSION-PROOF MOTORS

with Corrosion-Resisting Features

CLASS I, GROUP D DESIGN

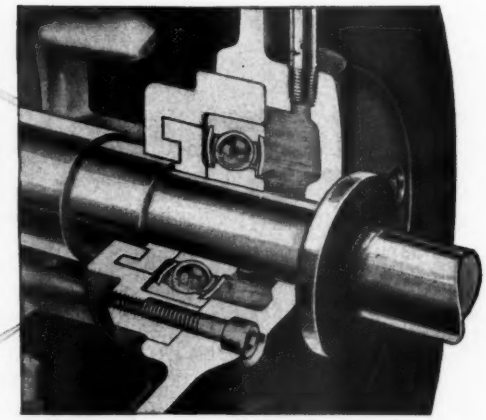
These special application motors are PRECISION-BUILT for safe operation in hazardous locations and manufactured to the standards of the Underwriters' Laboratories for Class I, Group D or Class II, Group F and G. With the addition of cable outlet, they will also meet the standards of the U. S. Bureau of Mines for use on permissible equipment.

An "extra" of vital importance in many locations is the high degree of corrosion-resistance provided by such features as monel name plates, grease pipes and shaft "slingers" and heavy, non-sparking bronze fans. In addition, all joints are sealed, all fits precision-finished, all cap screws made of heat-treated steel and immersed in asphaltum before assembly. Write today for Bulletin C-130 which gives further information you will want to have on Reliance Explosion-Proof Motors, or phone your nearest Reliance representative.

RELIANCE *Precision-Built* MOTORS

. . . an explosion-proof design for the RELIANCE PRECISION BEARING MOUNTING!

The Reliance Precision Bearing Mounting which has proved so successful in providing longer bearing life is made explosion-proof through a lengthened path from the bearing to the inside of the motor. Illustrated at right: Cross-sectional view of front end bearing, frame 204.



Sales Representatives in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

"Motor-Drive is More Than Power" • 1116 Ivanhoe Road, Cleveland 10, Ohio

Now CARSET JACKBITS give even better performance

. . . with this new attachment developed exclusively for use with tungsten carbide bits

(Series 100 Carset Jackbits)

The experience gained in the field with hundreds of thousands of Carset Jackbits, has enabled Ingersoll-Rand engineers to develop an attachment that matches the revolutionary performance and long life of Carset Jackbits. It is the only attachment now available designed primarily for use with tungsten carbide bits.

This new attachment incorporates a patented 38-degree reverse buttress thread. After exhaustive tests, it was selected as the best design to cushion and absorb the destructive reciprocating and rotational forces that tend to wear bit threads or break the threaded extensions on drill rods.

In addition, the attachment permits appreciably more metal in the skirt walls of Carset Jackbits which greatly increases their body strength. This added metal makes the strongest possible bits. This is particularly important in small bit sizes.

In short, even greater economies are now possible from Carset Jackbits. This new attachment is designed to give trouble-free service for the life of the bit.

The Ingersoll-Rand Series 100 attachment is offered in four sizes and covers bit gauges from 1⅜ inches to 3 inches. It is easy to make this attachment...upset the drill rods on a sharpener and form the threads on an engine lathe or a Toledo threading machine. Write today for full information to Ingersoll-Rand Company, New York, or any of our 27 domestic branches.

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NOW! completely new, easy loading and dumping **GAR WOOD MODEL 625 SCRAPER**...built to take full advantage of the greater working ability of the big, powerful, smooth operating **ALLIS-CHALMERS HD-19** Hydraulic Torque Converter Tractor

A rugged, tough combination — built to give you bigger output at lowest possible cost per yard . . . under all operating conditions.

ALLIS-CHALMERS HD-19 TRACTOR

- 40,000 lb.
- 163 hp. at flywheel.
- More traction, more ground contact, better balance.
- Hydraulic torque converter drive — eliminates most shifting, provides smooth, cushioned performance.
- Infinite number of speeds in only two gear ranges — 0 to 3 mph. in low and 0 to 7 in high.
- Simplified servicing and maintenance . . . reduced lubrication . . . easier operation.

GAR WOOD 625 SCRAPER

- 24.5 cu. yd. heaped capacity; 19.2 cu. yd. struck capacity.
- Open bowl design.
- Forced, controlled ejection.
- High clearance and low center of gravity.
- Extra strength throughout — plenty of beef where needed.
- Exceptionally wide apron opening.
- Live boiling action that distributes dirt into both bowl and apron.
- Large tires for greater flotation.

"Seeing is Believing." Ask your Allis-Chalmers Dealer for a Demonstration.

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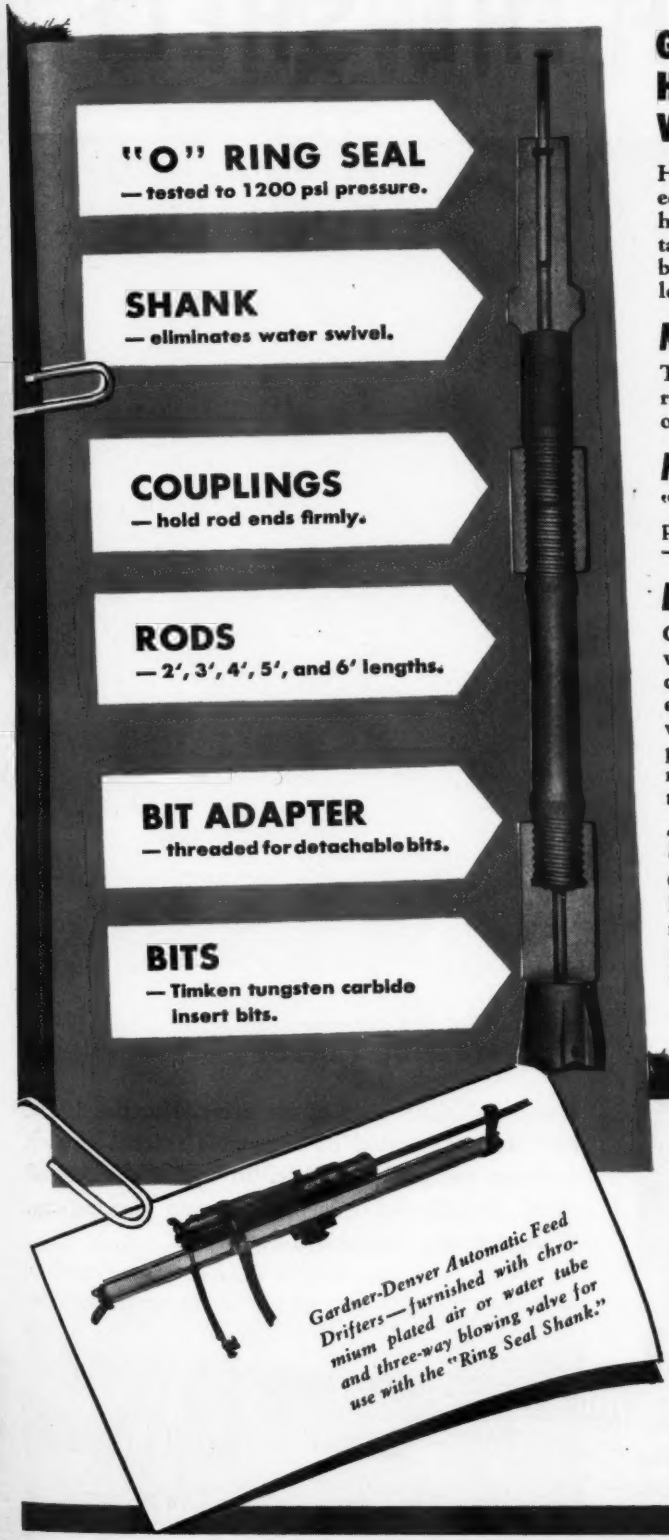
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Originator of the Torque Converter Tractor

FOR GREATER PRODUCTION • FOR EASIER OPERATION • FOR SIMPLIFIED SERVICING

TODAY'S BIGGEST NEWS IN DEEP HOLE DRILLING


"O" RING SEAL
— tested to 1200 psi pressure.
SHANK
— eliminates water swivel.
COUPLINGS
— hold rod ends firmly.
RODS
— 2', 3', 4', 5', and 6' lengths.
BIT ADAPTER
— threaded for detachable bits.
BITS
— Timken tungsten carbide insert bits.
Gardner-Denver Automatic Feed Drifters—furnished with chromium plated air or water tube and three-way blowing valve for use with the "Ring Seal Shank."

GARDNER-DENVER DEEP HOLE DRILLING EQUIPMENT WITH "RING SEAL SHANK"

Here's a whole new set of field-proved drilling equipment that will revolutionize your deep hole drilling. Now, for the first time, you can take full advantage of tungsten carbide insert bits and modern rock drill power for faster, lower cost deep hole drilling.

No more water swivel troubles

The new Gardner-Denver "Ring Seal Shank" replaces the old type water swivel at a fraction of the cost—eliminates water swivel troubles.

Higher blowing pressures

"Ring Seal Shank" delivers water or air at any pressure that can be used on deep hole drilling—assures positive hole cleaning.

Longer rod and coupling life

Gardner-Denver sectional rods and couplings withstand the shock and grind of deep hole drilling—last much longer than conventional equipment — because they're manufactured with the same skill and precision as rock drill parts. Rod design has been carefully engineered to minimize stress concentrations and to form a tight union between all parts.

Tested and proved in the field

Gardner-Denver deep hole drilling equipment has been widely field tested—is now in use in many United States and Canadian mines—drills prospect holes at a fraction of the cost of diamond drilling.

Write today for complete information.

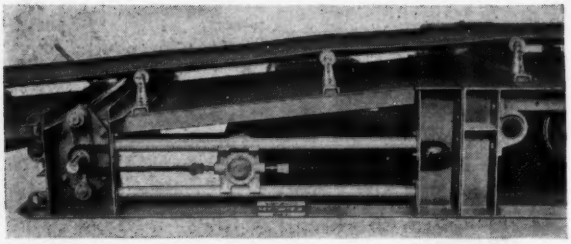
GARDNER-DENVER

Since 1859

Gardner-Denver Company, Quincy, Illinois.

In Canada:
Gardner-Denver Company (Canada) Ltd.,
Toronto, Ontario.

WHATEVER YOU NEED GET IT "OFF-THE-SHELF"

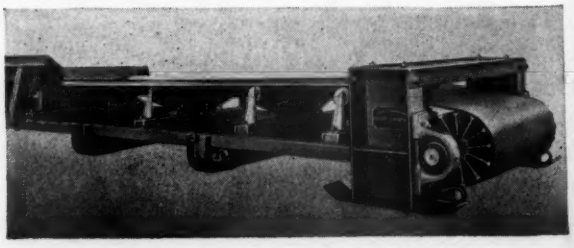


INTERNAL TAKEUP

Located directly back of the drive. Handles 10′ of belt slack. Operated by reversible ratchet-wrench working on gear reduction to minimize manual effort. Double-acting pawl prevents backing-up. Worked from either side of conveyor.

TAIL SECTION

Telescopic type to provide tail takeup action. Easy to clean out—no steel work under tail pulley. Has transverse cover to protect pulley, bearings *and belt.* Strong enough so you can rest a feeder on it.



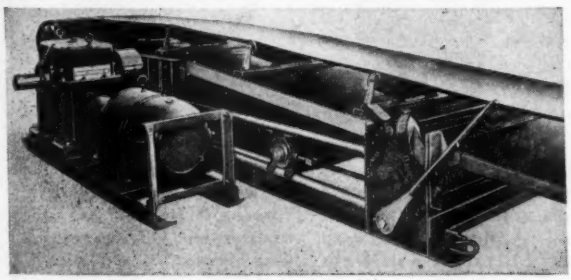
IN A MINE CONVEYOR— AT HEWITT-ROBINS!

Shipped Complete—Right Out of Stock— from Passaic, N. J., and Charleston, W. Va.

Every mine is different—every mine has different underground conveying problems. That's why Hewitt-Robins makes not one but *three* different types of mine conveyors. That means mine operators can match Hewitt-Robins equipment against their own *specific requirements* and get exactly what they need, right out of Hewitt-Robins warehouses in Passaic and Charleston. Not just the conveyor machinery itself, but belt, motors, reducers and drives!

Hewitt-Robins *Types I* and *IS Mine Conveyors* have *internal* drive for level, *up*hill or *down*hill operation; in 26", 30", 36" widths, lengths up to 3000 feet or more if needed. *Type H* has head drive for level or *up*hill operation; in 26" and 30" widths, lengths up to 2000 feet.

Intermediate Sections are standard, fit all types, simple to assemble because both ends are identical and need no "matching up." Available in 8′ and 10′ lengths. Also available are standard 12′ Intermediate Sections—channel construction, bolted connections—for permanent 30", 36" and 42" wide main haulage installations. using the standard terminals.

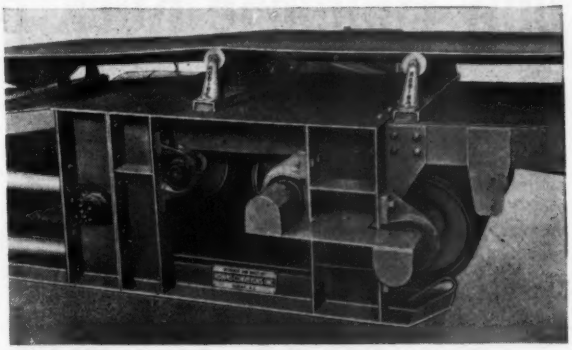


UNIFIED DRIVE SECTION

Motor, reducer and controls mounted on a single base—skid-designed for easy moving about. Can be located on either side of the conveyor. Drive reversible—incoming for men and material, outgoing for high output of product.

You can choose single or tandem pulley drive, internal or tail takeup, the length and belt width that fits your particular mine . . . but in every case you get famed Ajax® heavy-duty belting, Hewitt-Robins ball-bearing, one-shot lubrication idlers, lagged pulleys for maximum power transmission . . . over half a century of engineering and manufacturing know-how!

Remember—*only Hewitt-Robins* makes both machinery and belt; *only Hewitt-Robins* is willing and able to take unified responsibility for successful installation and operation! For complete specifications—or out-of-stock delivery—write Hewitt-Robins Incorporated, 1010 Pennsylvania Ave., Charleston, W. Va., or 270 Passaic Ave., Passaic, N. J.



SINGLE OR TANDEM DRIVE

Hewitt-Robins Mine Conveyors come equipped with *both* single and tandem pulley drive elements. Provide ample horsepower for lift and length up to the very limits of belt capacity. Reeving of belt handles level, uphill or downhill service requirements.

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MINE CONVEYORS

HEWITT-ROBINS INCORPORATED

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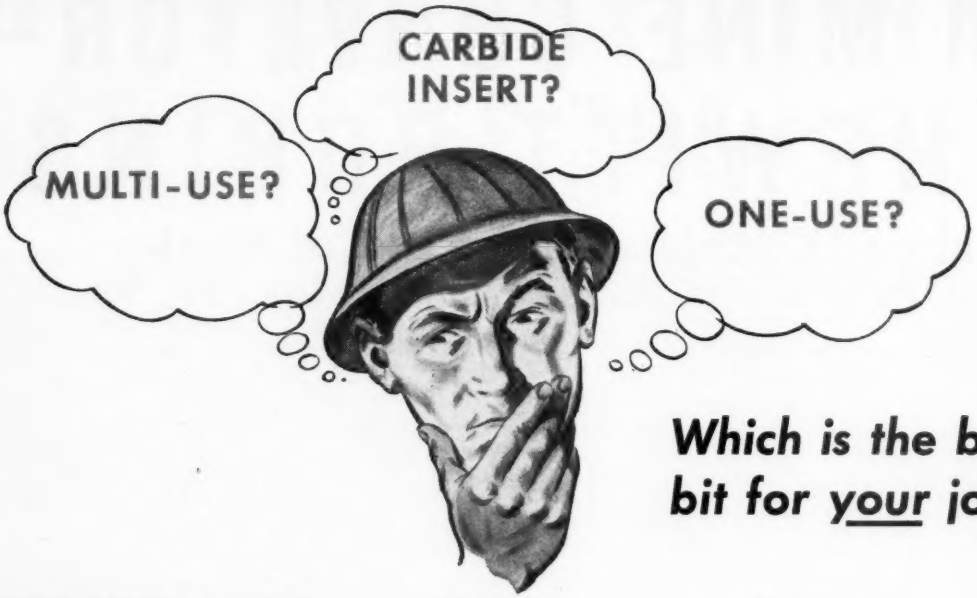
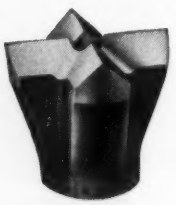


Which is the best bit for <u>your</u> job?

TIMKEN® offers <u>all 3</u> types—brings you the only <u>complete</u> Rock Bit Engineering Service!

TIMKEN® makes all three rock bit types—multi-use, carbide insert, and one-use. And to help you select the one best bit for *your* job, Timken offers the services of the world's largest field engineering organization devoted exclusively to rock bit problems. With all three types of rock bits to draw upon, the Timken Rock Bit Engineering Service can help you get the bit performance you're after—whether it be lowest bit cost, lowest cost per foot, greatest possible drilling speed or other desired advantages.

This is the only service of its kind, because only Timken makes *all three* rock bit types and only Timken has had so many year's experience with all kinds of rock drilling problems. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



1. MULTI-USE Basic removable rock bit for 18 years. Gives lowest cost per foot when full increments can be drilled and control and reconditioning of bits are correct. Low cost. Requires less policing than carbide insert bits.

2. CARBIDE INSERT For extremely hard and abrasive ground, small holes, extra deep holes. Lets drillers spend more time drilling — less time changing bits. Holes go down faster. Bit reconditioning is simplified.

3. ONE-USE "SPIRALOCK" For use where reconditioning is impractical or undesirable. Offers lowest unit bit cost. New "Spiralock" union holds bit on dependably—permits easy removal. Simplifies steel preparation, makes steels last longer.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

. . . your best bet for the best bit . . . for <u>every</u> job

FREE BOOKLET! Everyone who buys rock bits should have a copy. Gives full information on all three types of Timken rock bits and the Timken Rock Bit Engineering Service. Shows full line of bits in actual-size photographs, with detailed descriptions. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Mining CONGRESS JOURNAL

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
SHELDON P. WIMPFEN, *Editor*

VOLUME 36 MAY, 1950 NUMBER 5

Is Mining Expendable?

MOMENTOUS events—mostly bad ones for domestic metal mining—are taking place. Foremost among the steps that would prepare metal mining for the last rites is the current action on tariffs.

Last year new tariff concessions were adopted at Annecy under the General Agreement on Tariffs and Trade (GATT). Not all of the tariff cuts set then, under Reciprocal Trade Agreements, have as yet been put into effect. But on April 11 the Department of State published notification of a third "round" of tariff negotiations to take place at Torquay, England, next September.

United States participation in the Torquay tariff talks comes under the two-year Trade Agreement Extension Act of 1949, which eliminated the U. S. Tariff Commission's role in determining "peril points" below which injury might result to domestic producers. Some 2500 commodities are on the list for possible tariff concessions, including lead and zinc in various forms, manganese, china clay and kaolin, ferromolybdenum, chrome metal and alloys, mica, talc, barium, titanium, crude feldspar, uranium, vanadium, zirconium and a long list of iron and steel products.

What lies behind this concerted and continuing campaign to eliminate tariff protection? Administration proponents claim that the negotiations and adoption of further concessions reducing tariffs on imports "will help solve the problems involved in United States foreign-assistance programs and the 'dollar gap' by helping foreign countries to improve their economies, increase their production, and to pay with their own goods and services for the United States products which they would like to buy and which United States producers would like to sell abroad."

That is the picture through rose-colored glasses. But, seen in the light of realism, those Utopian, "One-World" dreams become the unpleasant scene of placing the mining industry on the sacrificial altar—a further offering to the Administration fetish of world rehabilitation and improved standards of living for all peoples, everywhere.

This Nation boasts the world's greatest industrial machine, a system that produces nearly all that its people desire. For the most part, the raw materials that are fabricated into consumer goods are produced within our borders. Our political-economic freedom has enabled industry to give us the highest standard of living. Americans prefer to buy and use domestic products that they know are superior to those produced anywhere else.

Thus foreign automobiles are a rarity on the streets of American cities. Furniture, household appliances, clothing and almost every manufactured item that Americans buy and use are made here at home.

Little could be accomplished by the "planners" if they attempted to foist upon the American people the inferior products of foreign manufacture. But lead is lead and zinc is zinc whether it comes from mines within our borders or is mined at lower cost by native labor in some distant land. The consumer is unable to determine the source of the metal in the host of products he buys, although he may readily determine where the final article was produced.

Facing these facts, where then would the economic planners throw their weight to attain their objective of "helping foreign countries improve their economies?" Obviously mining is the goat. Imports of foreign metals in increasing quantities not to mention the critical increase in imports of crude oil which are "drowning out" our own coal industry—can spell the finish of domestic mining in other branches than those of mercury and antimony which have already been eliminated by this method. By making foreign countries dependent upon us for a market for their raw materials the planners would achieve their aim of firmly binding those nations to us.

We question whether this end is worth the sacrifice. Events have proven that a full belly is neither guarantee nor much inducement to depart from the Communist line. The billions of dollars that have been poured out to bolster sagging Europe economies offer no assurance of assistance when and if the chips are down in the event of another world war.

Maintenance of mineral supply is *the* vital factor in national survival. Mined raw materials cannot be produced as one would draw water from a spigot. Years are required to develop a producing mine. Yet, if we depend upon foreign sources for these essential raw materials, we may be rudely awakened to find that supplies can be cut off at a moment's notice.

All carefully weighed economic thinking leads to the inevitable conclusion that a strong domestic mining industry must be maintained. A realistic tariff program is necessary to attain this objective. At the same time, intelligent diplomatic action is required to assure sources of minerals in which we are deficient. Augmented stockpile purchases would be an important factor in a program to strengthen our mineral position.

These are recommended actions that would aid the growth of mining as a strong and aggressive part of our economy. As opposed to this plan, extensive tariff cuts can only lead to bankruptcy of our vital domestic mining industry.

The Preservation of Private Enterprise

Senator Robertson of Virginia staunchly supports the American system in which political liberty and free enterprise are interdependent and points out the inherent hazards of monopoly. His forceful address, delivered at the Coal Convention of the American Mining Congress on April 24, is presented here in full. Every American is urged to read these pages carefully, that he may more fully understand and jealously guard our rich heritage of political and economic freedom.

Hon. A. WILLIS ROBERTSON
U. S. Senator from Virginia

TO live in these midyears of the twentieth century is to be aware that civilization is passing through one of the great critical periods of history. The present epoch has, indeed, few parallels in the past. Today, under the pressure of dramatic and far-reaching changes in the technical, cultural, political and economic dimensions of existence, men are conscious that the fundamental structure of society, the most profound bases of government and personal life are at issue. Confronted by challenges of such immense scope and gravity it becomes necessary to see clearly and steadfastly the aims and principles which underlie free economy and free government.

The anti-God ideology of communism now dominates the lives of 200,000,000 people in the Soviet Union, 100,000,000 people in the so-called satellite countries of Western Europe and 400,000,000 people in China. Leaders of the Soviet Union are applying constant pressure both in Western Europe and in the Orient to expand their area of influence, with total world domination their ultimate goal. In that struggle a free and economically sound America is the hope of humanity.

The principal difficulty of democratic leaders in trying to reach an agreement with Soviet leaders to end the cold war stems from the fact that there is no fundamental premise of human rights and ethical conduct upon which the conflicting interests can agree.

Fortunately, there are certain fundamental premises which if not overlooked may readily be accepted by thinking and patriotic American citizens. Such a list would include the following:

(1) Our conception of human rights and ethical principles is based upon the teachings of the Bible and the teachings held in common by all the great religions of mankind.
(2) The American system of competitive enterprise is unique in the world.
(3) Private but properly regulated enterprise in a capitalistic system and personal freedom in a representative democracy are handmaidens and if one be lost the other is doomed.

In selecting my topic today, the preservation of the American system of private enterprise, I had in mind the 8000-mile trip I took last fall through 14 countries in western Europe, from Oslo on the north to Athens on the south, where on every hand I saw the debilitating effect of that misnomer called "democratic socialism." I likewise had in mind the numerous measures presented to the Congress during the past three years whose ultimate effect would be to substitute the same type of socialism for American Constitutional freedom and the American system of private enterprise.

The methods, the objectives and the conditions necessary for the functioning of political freedom depend in their essence upon economic freedom. To recognize that the present era contains dangers which can jeopardize the framework of a free society is to realize that, in fact, there can be no genuine political freedom which is not sustained and nourished by the strength, the flexibility, and most important—the legal institutions and practices—of an economy of free, private, competitive enterprise.

Economic Freedom Basic to Political Freedom

The whole history of the last two centuries demonstrates with a certainty beyond cavil that where economic opportunity for initiative is blocked, where competition is stifled or suppressed by monopoly or governments, where the right to choose a trade or profession, or to move from one field of endeavor to another is nullified, the loss of political liberties becomes an immediate threat, and in time a most probable, even inescapable consequence. In the stark con-

trasts between the experience of this country and much of the rest of the world it is sharply apparent that many of the peoples who have lost their liberties already, or are struggling against odds to retain them, have been misled into a fateful error—the belief that it is possible to maintain political democracy and representative government in full vigor while yielding freedom of enterprise, and with it the power of control over their economic destinies. It is not possible for this to be done. Political and economic freedom are root and branch of the same tree.

How did freedom of enterprise originate, but as the mainspring of the struggle for liberty? Our American system of government, unique in that our Declaration of Independence said for the first time in recorded history that government derives its just powers from the consent of the governed and unique in the possession of a written constitution in which, without spelling it out, the principle of private enterprise is firmly embedded, has some roots in the ancient culture of the Jewish people through whom the ten commandments and the principles of the Sermon on the Mount were handed down to us. He does not know his American history who does not know that our Founding Fathers were deeply religious, asking the Father of Light to illuminate their understanding and firmly believing that if a sparrow cannot fall to the ground without His notice a new and enduring Republic could not rise without His aid. It has roots in the Greek system from which the name "Democracy" was borrowed. It has roots in the culture of Rome which brought system and order into the realm of law and it sprang directly from the experience of the British people who had constantly enlarged the area of rights assured to the common man by Magna Carta.

"We the People"

But our American constitutional government cannot be said to be the "same" as the governments from which it drew inspiration any more than the atomic bomb can be said to be the same as the various incendiary, fragmentation or penetration bombs which were in use before it was developed.

Something akin to nuclear fission occurred during our struggle for freedom from the ancient doctrine of the Divine Right of Kings. The ideal of liberty, of economic and political rights guarded by law, transformed a colony of empire into a citadel of Democracy for the world.

The trigger which set off the chain reaction may be found in the words of Thomas Jefferson who wrote, in the Declaration of Independence:

"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain inalienable Rights, that among these are Life, Liberty, and the Pursuit of Happiness."

The preamble to the Constitution started with the significant words "We the People." There were some patriots, including Patrick Henry, who feared those words indicated too strong a central government but in spite of their protests a document whose drafting was guided by the hand of destiny was ratified. Ratification came, however, only after James Madison and others had promised that amendments would be offered which would perpetually prevent the government from following the historical pattern of usurping the rights of the people.

In keeping with this promise, when the first Congress met in 1789 it approved ten amendments which were adopted the following year. These amendments, which we know as the Bill of Rights, set the boundaries beyond which the Federal Government must not go in interfering with individual liberties and property rights. They mentioned certain rights specifically but concluded with the flat assertion that the enumeration of these rights "shall not be construed to deny or disparage others retained by the people," and the added statement that "The powers not delegated to the United States by the Constitution, nor prohibited to it by the States, are reserved to the States respectively, or to the people."

Liberty—A Political-Economic Compound

From the hurried survey which I have just given of the basis of our Government the fundamental truth stands forth that where, as in Europe, freedom of enterprise never achieved its full stature, political freedom has been correspondingly warped and inhibited. Even in Britain, where Adam Smith became the greatest spokesman for the "simple and natural system of economic liberty," the conditions of free competition were always circumscribed. As Lionel Robbins, the British economist, has said with reference to English experience, "Liberalism—is not a plan that has been tried and failed. It is a plan that has never yet had a full chance."

It may be said, indeed, that only in the United States at the time of its establishment was there a profound comprehension of the significance, even the identity, of freedom of enterprise with free political institutions. In this respect, the Government and Constitution formed by men with wide perspective and realistic vision were unique, and produced a society uniquely free, uniquely capable of growth, and now, almost the sole example of a nation able to meet its problems and master them with the strength of democracy and the support of a free economy.

Many eminent authorities agree that it is this quality of the work of those who brought a new nation into being which has been the major factor responsible for America's economic development. What is more, there is almost complete accord of opinion that it is the striking differences between this setting of American industry, with its free and competitive basis, and that of shackled European industry, which have meant the great disparity between ways of doing business here and abroad. Moreover, these differences have spelled the perpetuation and increase of opportunity and constantly rising standards of living for the American people, and a tragic spectacle of bitterness, class conflict, deprivation of liberty and the ultimate drift away from all freedom for the populations of Europe.

Free Enterprise Is No Accident

It is well to understand that the system of free enterprise and representative government have the same historic sources, and that in many basic respects American free enterprise represents as much of a contribution to the growth of civilization as does the American form of government. Thus, for example, a former assistant attorney general, a recognized student of the question, has said:

"The convictions which form the framework of the American economy rank high among the social inventions of modern history. It is no accident that the idea of free enterprise emerged from the age of reason. The same period which conceived and established political democracy was logically compelled to foster enterprise as the indispensable economic cornerstone of a free society. Before that time there had been neither political nor economic freedom for the great majority of mankind. Status, privilege, and power governed both the political and economic destinies of the ordinary man. To displace this feudal order and to construct the foundations of a democratic society required the determined efforts of several generations during the industrial revolution.

"At the outset, it was realized that representative government in order to survive must rest upon the bedrock of political freedom, the ethical and legal equality of all citizens, and the integrity of a public interest which embraced every member of society. It was appreciated that the economic life of democracy must be rooted in the fertile ground of initiative, of equal opportunity, the right of choice in occupation, the guarantee that no artifice of exclusion would control the market, and the assurance that the economic interests of the public would not be narrowed by privilege.

"The essence of political democracy

is the free election. The essence of economic liberalism is the free market.—These freedoms are both the products of reason. Both are systems of liberty under law."

It is necessary to distinguish carefully both the economic and legal concepts involved in the relationships between government and enterprise under the American Constitution and, in contrast, under the British and European types of government. It is possible, perhaps, to crystallize these facets of the problem by summarizing certain considerations:

First, there is a distinction between certain interpretations of "laissez-faire" and the freedom of enterprise as an organizing principle of economic activity.

Second, there is a distinction in theory and in fact between regulation and planning of economic activity.

Third, the American Constitution, as a system of checks and balances, contains safeguards against the loss of the right of enterprise which are not present in other constitutional systems, such as that of Great Britain.

Fourth, the principal characteristics of American industrial enterprise, both in its relation to governments and its functioning in practice are inherently, as well as historically, different from European industry.

Fifth, the approaches made toward problems arising from industrial change and industrial behavior must necessarily be distinct in the United States from the theories and assumptions derived mainly from European experience.

Sixth, both economically and politically, the American form of government and the American economy possess basic techniques and conceptions, grounded in tradition, law, and practice for the correction of undesirable effects or mistakes which are not present in European countries or in Britain, in fullest measure.

There is, it may be observed, a broad and mobile area produced by these premises of action which makes possible an adaptive adjustment, a moving balance in the relationships of government, industry and labor under a free enterprise system which reciprocally strengthens and is dependent upon representative democracy. American industry as a whole is dynamic, the most highly advanced as it is generally the quickest to change where there are no barriers to innovation, of any comparable industrial complex in the world. This genuine spirit of achievement is reflected in the confidence with which American industry undertakes long-range and short-range improvement programs, from the development of a matchless machine-tool industry or the perfection of a new household appliance to the manufacture of the innumerable "gadgets" which change with every fancy of the consuming public. No other economy endeavors as does American enterprise to discover the desires and needs of consumers and to satisfy them. There is a respect for the individual, for the human personality, which permeates the free enterprise system to a degree not equalled by any other economy of the past or present.

American industry is always responsible and responsive, necessarily, both to law and opinion of the public. This point and counterpoint of incentive and reward for the assumption of risk, the acceptance of occasional loss, the impetus toward beneficial improvements and high standards of efficiency, behavior and service, all subject to the legal and social scrutiny of conduct, are essential attributes of the free enterprise system. They are so central to its meaning that they can be said to converge with the meaning of free government. The loss of either one would signalize the loss of both.

At the outset of my remarks I referred to the spread of socialism in western Europe which is sapping the vitality of industry and gradually impinging upon the liberties of the people. I am convinced that western Europe could not have stemmed the tide of communism without our ECA aid and I am not convinced, notwithstanding marked progress in production, that western Europe will be self-supporting when our aid ends in 1952 in the absence of economic integration, which means the creation of a freer system of trade.

When the nations of western Europe and notably Great Britain to whom we are indebted for our first conceptions of the fundamental rights of man, chose to go down the road to socialism by nationalizing basic industries, there was nothing in the structure of their governments to prevent such action. Magna Carta does not say that the government shall not take over the railroads. The Statutes of Praemunire offer no court remedy to the owner of a steel mill who is reluctant to give it up to the government. The whole body of the Common Law contains nothing to prohibit nationalization of coal mines.

On the other hand, the Constitution of the United States does not authorize such actions and the Bill of Rights prohibits the assumption by the Federal Government of powers not delegated to it. The Founding Fathers had listened to the words of Thomas Jefferson who said: "In questions of power, then, let no more be heard of confidence in man, but bind him down from mischief by the chains of the Constitution." They framed a government designed to protect individual enterprise as well as personal liberties.

Block the Byways to Socialism

Certain concessions have been made in time of war on the theory that the government can assume certain additional functions to provide for the common defense. But in time of peace the boundary protecting private enterprise has up to now been clearly marked. Thus, when the Federal Government wanted to build roads, it was allowed to do so only on the theory that this was a reasonable extension of the constitutional function of providing for delivery of the mails. And, although action of the government in building a steam power generating plant was upheld by the courts, this was done on the theory that it was to be used as an adjunct to the development of natural water resources and was not an independent business enterprise.

Today, however, we see constant efforts to push back the boundary line between government and business and we need to recognize that these efforts

Thomas Jefferson—Champion of equal and exact justice to all men

may constitute a creeping socialism which can undermine the Constitution and do by indirection what cannot be done directly.

We are asked to approve a social security system which cannot be self-supporting and which ultimately would make all of our aged, disabled and unemployed wards of the Federal Government.

We are urged to approve a system of federal aid to education which would lead ultimately to federal control over our school systems.

We are confronted with proposals for compulsory health insurance which would result in the medical profession receiving most of its compensation from the hands of the government and which would rapidly lead to socialized medicine as it is practiced in Great Britain.

Under the deceptive label of civil rights, we are placed under pressure to approve a program which would permit federal officials to supervise local elections and to pass on the competency of local law enforcement officers and punish those whose actions were not approved. This program also would set up a bureaucracy which could intervene in the relations of employers and employes and which would deprive individuals generally of one of the most basic of their inalienable rights—the right to pick their personal associates. In fact, this proposed FEPC, to which I am now referring, would specifically violate at least half of the Bill of Rights Amendments to our Constitution.

Such legislative proposals as I have mentioned constitute only one attack on our system of private enterprise. They would enable the central Government to assume powers exercised by those earlier governments which we drew from but did not copy.

The Hazards of Special Privilege

Another line of attack consists of the efforts of those who would invade the rights of the individual to obtain special privileges for certain groups or segments of our society. Sometimes this effort involves dependence on active protection by the government and at other times it is based on the assumption that the government will not interfere to prevent abuses.

For example, the Congress is asked to approve lending or other aid programs for housing which will make it possible for a small segment of our population to obtain shelter with less effort on their own part than is required of all the rest of the population.

We are asked to give exemption to labor groups from laws which have been established to prevent exploitation of the public by abuse of monopoly powers, regardless of the fact that when a Government permits a labor monopoly to abuse its powers one of two things necessarily results—the Government must then either permit industry to counter the labor monopoly force with an industrial monopoly force or nationalize the industry.

To be specific about that last point: Last summer the Senate Banking and Currency Committee authorized me to conduct an inquiry into the effects of economic power of labor organizations upon small business and consumers. Our inquiry was a general one but we gave particular attention to the problem as it was exemplified in the coal industry. The conclusion which we reached, and embodied in

Atop the Capitol stands Freedom—symbol of economic, political, social and religious liberty

our Committee report, was that the United Mine Workers, under the direction of John L. Lewis, were using their power in an attempt to control prices and production and that if this usurpation and abuse was tolerated, its unbridled use would spread from union to union and industry to industry and that Congress would never regain its narrowly circumscribed power to guide the economy consistently with the Constitution of the United States.

Big Labor Threatens Freedom

Studying the evidence given at this hearing, which amounted to approximately 1000 printed pages, I concluded that the trouble came from the fact that a 1941 court decision had upset the balance between antitrust laws originally enacted for the protection of all the people and the Norris-LaGuardia Act which was designed to protect the struggling labor movement against improper use of injunctive powers by powerful corporations. I therefore introduced in the Senate my bill, S. 2912, which would not interfere in any way with legitimate collective bargaining but which simply said that when labor organizations made *unreasonable* use of their monopoly powers—which they still would retain—and in doing it restrained trade or commerce essential to the national economy, health or safety, they could not hide from prosecution behind a court interpretation of the Norris-LaGuardia Act which was contrary to all previous decisions and contrary to the clear intention of the Congress.

I was told by many of those with whom I consulted before drafting this bill that it was too mild and would not adequately protect the public. I agreed that a prohibition against industry-wide bargaining would be more effective but said I wanted to try something which would at least offer some hope of protecting our private enterprise system together with some chance of favorable congressional action. When hearings were held on my bill, however, it was denounced by labor leaders as a "lynch labor" law—a shibboleth on a par with (or slightly below) a "slave labor" law.

In view of this I think I am justified in saying that in addition to being threatened today by "big government" and by "big business," our individual enterprise system is threatened by the short-sighted policies of "big labor." I say that as one who always has favored fair and generous treatment of labor but also as one who recognized the necessity of retaining the delicate balance on which our constitutional government rests.

We need today to recall the words of Benjamin Franklin who said: "They that give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety," and the words of Daniel Webster who said: "God grants liberty only to those who love it, and are always willing to guard and defend it."

Such a program involves a periodic review of the history of our own Government, a comparison of it with foreign governments that have failed and a frequent recurrence to fundamental principles.

As a descendant of a Virginia family that furnished one signer to Jefferson's Declaration of Independence and three members of the Virginia Convention that ratified the Philadelphia Constitution I take a pardonable pride in the contribution made by Colonial Virginia to the birth of a nation. I want to see passed on to generations yet unborn those precious principles of political and economic freedom that were born of the brain and purchased by the blood of our Founding Fathers. But down through the ages comes the warning of the Hebrew patriarch Job "Remove not the ancient landmark, which thy Fathers have set." May that motto be inscribed upon the heart of every lover of American constitutional liberty.

Underground Dust Control

The Problem and How One Mining Company Solves It to Maintain a Healthy Atmosphere

By JOHN W. WARREN

Assistant Chief Ventilation Engineer
Anaconda Copper Mining Company

IN recent years, numerous and varied conditions have caused the mining industry to study contaminants in the atmosphere in order that factual data could be obtained on which practical preventive measures could be based. Silicosis, the most common pneumoconiosis, and allied to the mining industry has recently been defined by the American Public Health Association as:

"A disease due to breathing air containing silica (SiO_2), characterized anatomically by generalized fibriotic changes and the development of miliary nodulations in both lungs, and clinically by shortness of breath, decreased chest expansion, lessened capacity for work, absence of fever, increased susceptibility to tuberculosis (some of all of which symptoms may be present) and by characteristic X-ray findings."

Thresholds Guide Dust Control

The permissible limits, thresholds or maximum allowable concentrations are guides in the determination of the concentration of the atmospheric environment in a worker's breathing zone. Maximum allowable concentration has been defined somewhat as follows: "The average concentration to which an industrial worker may be exposed for eight hours daily for an indefinite period without injury or occupational disease." There has been some controversy over the definition and the disagreement increases as the component phrases are added to the definition.

TABLE I
METHOD OF CALCULATING A WORKER'S EXPOSURE

Operation	Exposure Hours 1	Average Dust Concentration M/cu ft 2	Particle Hours 1 x 2
Wetting Down	0.25	0.80	0.20
Setting Up Drill Jib	0.30	0.30	0.09
Drilling	4.00	3.20	12.80
Changing Bits	0.50	2.16	1.08
Tearing Down Drill Jib	0.30	0.40	0.12
Blowing Holes	0.60	2.70	1.62
Loading Holes	0.85	0.40	0.34
Delays	0.60	1.16	0.70
Miscellaneous	0.60	0.90	0.54
	8.00		17.49

$$\text{Average Exposure} = \frac{17.49}{8.00} = 2.19 \text{ M/cu ft}$$

In the last ten years, the listings of maximum allowable concentrations give values which refer to repeated exposure rather than those for acute effects.

The thresholds, permissible limits or maximum allowable concentrations are the result of the collection of considerable data and intensive studies.

The South African gold mines offered one of the first suggestions of a threshold figure. Fig. 1 from the South African Medical Research Institute shows the results of 25 years of practical experience in dust control in the mines. This graph shows a rapid reduction in dustiness from 150 mg per cubic meter to 20 mg per cubic meter by 1910, and a further reduction to 5 mg by 1915. During the next ten years, the concentration was lowered to 1 mg per cubic meter. A concentration of 1 mg per cubic meter is called the South African standard. In 1934, L. G. Irvine, chairman, Miners' Phthisis Medical Bureau, stated: "No 'New Rand Miner' who has entered the industry since August 1923, has as yet contracted silicosis."

Fig. 2 shows the results of a study in relation of average dust concentrations and duration of dust exposure to workers having pneumoconiosis as determined by medical studies of some mine and quarry workers. This graph was published in "'Health and Miscellaneous Hazards in Metal Mines,' Miners' Circular No. 57."

From the graph it is evident that a worker can be exposed to a dust concentration of less than 10,000,000 particles per cubic foot without a toxic effect. It is also evident that as the

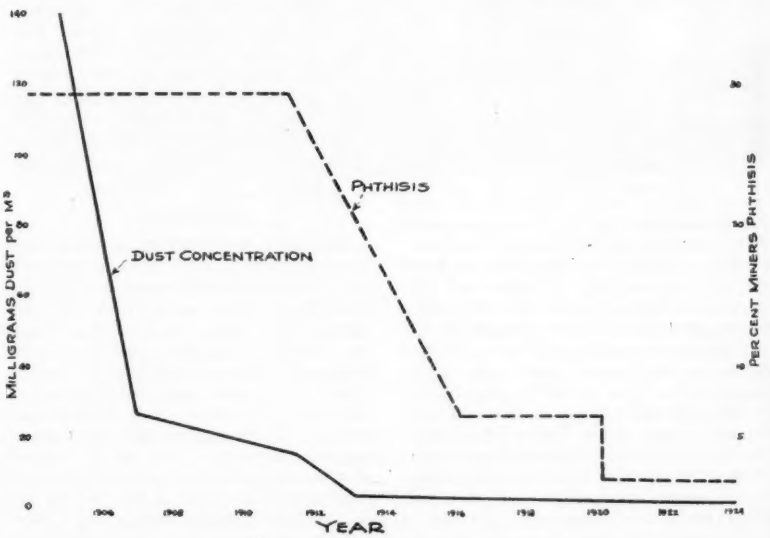


Fig. 1. Dust control and silicosis

dust concentration increases appreciably, the result of injurious exposure is noted.

From the two graphs, a conclusion can be drawn as to the effects of a properly prosecuted dust control program. The details of thresholds or maximum allowable concentrations for five states, expressed in millions of particles per cubic foot of air as determined by an accepted or approved method, are shown in Table II.

Dust control is an extremely important phase of safety and hygiene programs in underground mining operations. Because dust, once airborne, is most difficult to remove from the airstreams, every effort should be made to prevent generation of dust concentrations at the source. On these pages an experienced ventilation authority analyzes the problem and describes the measures employed by his company to allay dust.

Dust Concentration and Size

Sample collection for number concentration is done by the impinger sampling apparatus in midget, portable, self-contained form or as standard, full-sized equipment. Quantitation for number concentration is done by microprojector method either by portable midget or full-sized equipment with the use of light field illumination and at 1000 diameters.

Samples for particle size must be collected dry. This is generally accomplished with an Owens jet sampler. Quantitation is done by use of oil immersion objectives at 10,000 diameters.

The use of an electrostatic precipitor is made for samples where analysis is desired. The instrument serves for other purposes where electric power is available.

If one cubic centimeter, or approximately 1/16 of a cubic inch of quartz (Free Silica, SiO_2) were disintegrated into the air as cubes, one micron on edge, by drilling, blasting, mucking, or any other operation, there would result 1,000,000,000,000 particles. This would be enough dust to contaminate 200,000 cu ft of clean air with a concentration of 5,000,000 particles per cubic foot. This same amount of dust would be sufficient to contaminate a volume of air equal to that which is occupied by the Washington monument at 1,000,000 particles per cubic foot.

The area of the one centimeter cube of quartz is approximately 0.9 sq in., while the final area of the $(10)^{12}$ particles is slightly in excess of 64 sq ft or surface enough to more than cover the area of a 9 ft diam circle.

For conception of size, a 100-mesh wire gauze screen can readily be visualized. At a wire diameter of approximately 0.10 mm, and respective 0.15 mm opening between the weave of the wire, the ratio of space can also be conceived. In one square inch of the 100-mesh screen there are 10,000 openings. Through one opening of the 10,000 there can pass abreast in one plane 22,500 particles, having a maximum dimension of one micron.

Dust, as particulate matter that has a maximum dimension of ten microns or less, is considered to be of pathological consequence in heavy concentrations.

Dust, in the size ranges below ten microns, has no appreciable weight, mass, or volume but does possess area. It is upon this area that the molecular blows of the air, which acts as the transport medium, are directed and result in a vectoral component, which tends to keep the particles in suspension.

A spherical dust particle, ten microns in diameter, will settle approximately one-half foot in one hour. Dust particles one micron in size, when discharged from a stack 100 ft high into a ten mile per hour horizontal wind, have been carried 125 miles before deposition.

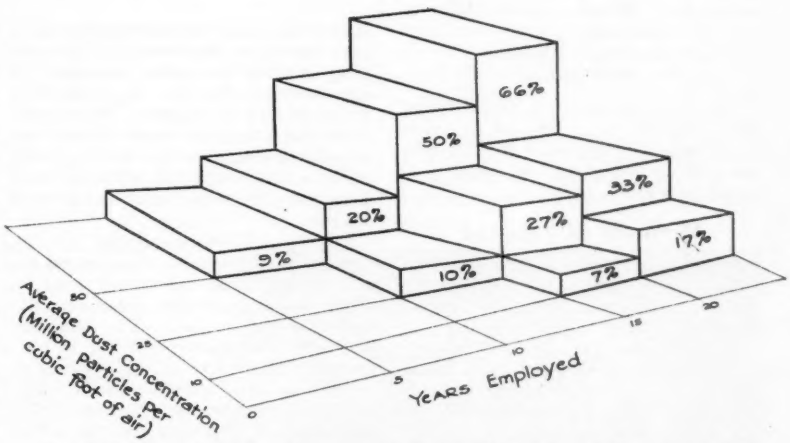


Fig. 2. Relation of average dust concentrations and duration of dust exposure to workers having pneumoconiosis as determined by medical studies of some mine and quarry workers

TABLE II

SOURCE	PERCENT FREE SILICA SiO_2	DUST CONCENTRATION M/cu ft
California	Less than 10%	50
	10% to 50%	10
	More than 50%	5
New York	Less than 10%	100
	More than 10%	10
Ohio	10% to 20%	20
	20% to 40%	10
	More than 40%	5
Wisconsin	35%	15 inverse
	100%	5.25 changes
Oregon	10% to 20%	20
	20% to 40%	10
	Over 40%	5
Governmental	Below 5%	50
Industrial	5% to 50%	20
Hygienists 1947	Above 50%	5

Free Silica and Combined Silica

Granites for example, when fresh, contain from 60-77 percent silica. Less than one-third of this silica is quartz, while the remaining two-thirds are the salts of the silicon-bearing acids and are known as silicates. The silicates are designated as combined silica, while the quartz which is the filling material is known as "free silica." It is the percentage of this free silica that determines the maximum allowable concentration values that are used as the yard stick in dust control.

Dust Control Supervision

The Anaconda Copper Mining Co. has, for the last seven years in the Butte district, conducted a training program for supervisors. All supervisory personnel are required to attend. Each yearly session is composed of three successive eight hour periods and includes a one-half day underground inspection trip. The subjects presented and discussed include:

(1) Mining methods
(2) Costs
(3) Safety
(4) Ventilation and dust control
(5) Service
(6) Job relations

A student miner training program, in which the features of dust control are given a prominent part, is also in force. Safety engineers play an important part in the enforcement of ventilation and dust control regulations.

A service department known as the ventilation department and headed by Mr. A. S. Richardson, chief ventilation and industrial hygiene engineer, has as its principal responsibilities:

(1) Ventilation
(2) Industrial Hygiene
(3) Air Conditioning

The department has a personnel of eight trained men. One to two men are specificially assigned to dust control and on occasions, the entire personnel becomes a unit.

Methods of Control

Since dust, when it becomes airborne, is very difficult to remove from the air stream, every effort is made to attack the source of generation.

Mine Yards:—All hoisting shafts are maintained as downcast inlets. The mine yards are paved with a "road-mix" topping to prevent dispersion of dust into the atmosphere which may enter the inlet source. The topping affords a higher standard of housekeeping due to the ease with which it may be cleaned. Wide angle sprays at the head frame vicinity are sometimes used to wet down the collar vicinity and are used when desired. They have no value under winter conditions.

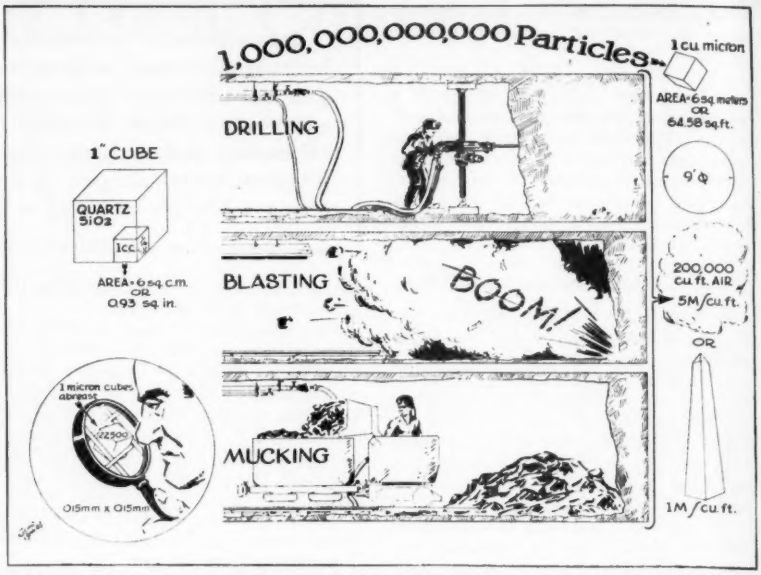


Fig. 4. What can happen when one cubic centimeter of quartz is reduced to particles of one micron on edge

Shafts:—Water atomizing sprays, which are connected to compressed air and water lines, have been used in some hoisting shaft compartments with marked success. The quantity of water and compressed air is controlled by the size of the contained orifice in the specific line. These sprays operate in each hoisting shaft and produce desirable results when spaced about 500 ft apart. They operate when needed and are controlled, from shaft stations.

In some cases, sprays have been used to skip chute doors on main and measuring pockets. These sprays operate only during actual skip loading. Studies have shown that the sprays decrease skip loading time and add only a small increase to the moisture content of the rock.

Compressed air and water blasts have successfully been used in winze and shaft sinking operations.

Where blow-pipes are used for "freezing" chutes, a water jet is introduced into the compressed air to be atomized before being discharged from the blow-pipe.

Sills:—A rule requiring the wetting down of face, back, sides and muck piles of all working places before

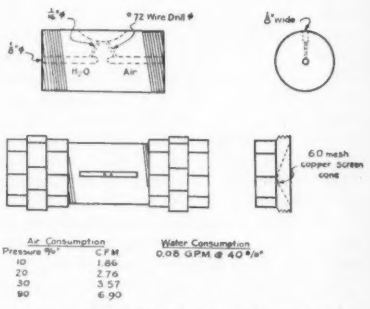


Fig. 5. Compressed air and water mist sprays have a wide application

starting any work is strictly enforced. Further wetting down to produce moist conditions during the shaft is required.

A compressed air and water blast is required in all sill headings. To perform with maximum effectiveness, their location should not exceed 30 ft from the breast. The Anaconda type operates best when handling a minimum of 2 gpm of water and not less than 70 cfm of air. The atomized water mist should continue from the time the round is spit, if fuse is used, or previous to the first detonation if electrically blasted, to include a 20 minute period of operation.

Since the pipes composing the air and water lines to the headings are not always the same length, a short length

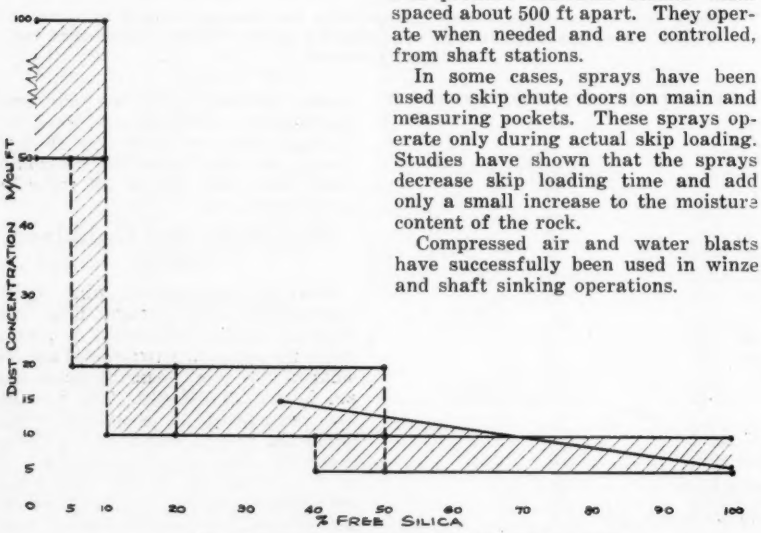


Fig. 3. Composite graph of thresholds for five states

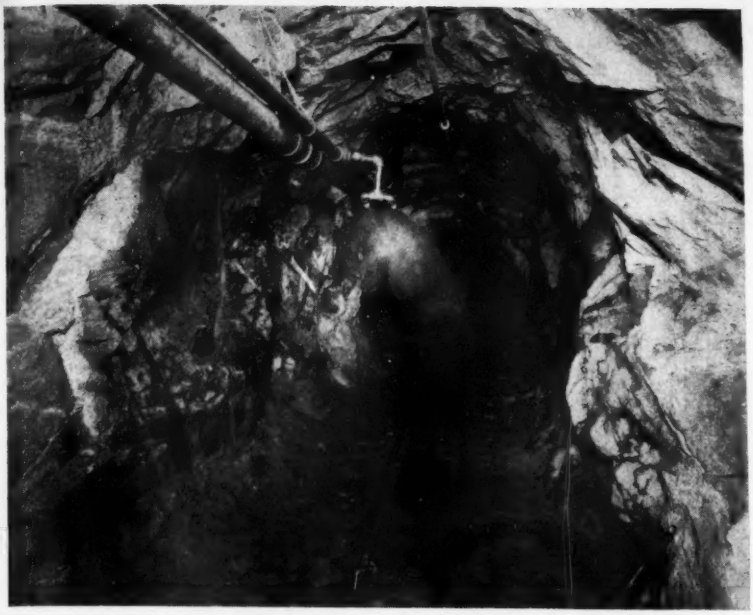


Fig. 6. A self-cleaning, atomizing spray allays dust in an airway

of scrap hose incorporating a nipple with a contained water orifice, is used to care for the length variable. Tests made with the compressed air and water blast show that practically all the nitrous oxides resulting from the blast are either dissolved or removed.

Tests in the headings were made within a short time after the last hole detonation. Entrance and sampling in the heading was made with the use of self-contained breathing apparatus. In sill headings, a special fitting is used on the discharge of the flexible air transmission ducts. These oblong and horizontal orifices deliver a flat tabular ribbon of air at high velocity toward the breast. The face is swept downward and dust concentrations generated at or near the face are carried away from the breast, generally below the worker's breathing zone. These end pieces also prevent a stream of high velocity air from striking directly upon a worker's body.

Raises:—A compressed air and water blast is used for a three compartment raise. The equipment is readily and easily installed, requiring connection from the air and water hoses which supply the drill. A novel feature of this equipment is the holes in the nipples of the blast on the discharge end of the hoses allowing selection in direction of the mist discharge.

An air transmission duct of not less than 12-in. diameter is required in all raises and the discharge of the duct shall be in a position not less than 8 ft from the back to insure the best air displacement. A "clean-out" tee, which is a part of the ventilation duct, is required at the bottom of all raises.

Drills and Drilling

Early in Anaconda's research program on dust control, it was known that there was a definite relationship between dust concentrations resulting from a drilling operation and the quantity of water passing through the drill steel to the cutting face of the bit. An extensive research program, conducted with the cooperation of the U. S. Bureau of Mines in 1937, confirmed the original findings. As a result, rock drills are now equipped with a larger diameter water tube.

Cooperative research work has resulted in information on the following topics:

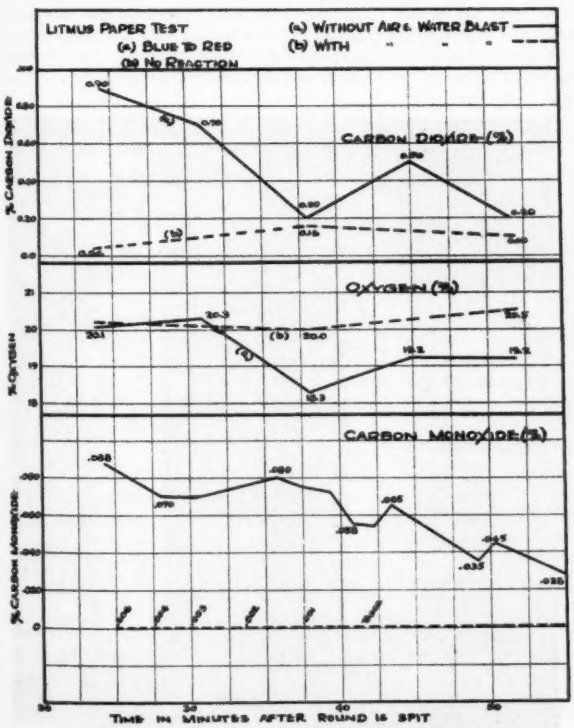


Fig. 7. Atmospheric environment after blast in heading

Fig. 8. High velocity air cleans headings to produce a healthy dust-free atmosphere. Note the flat discharge orifice

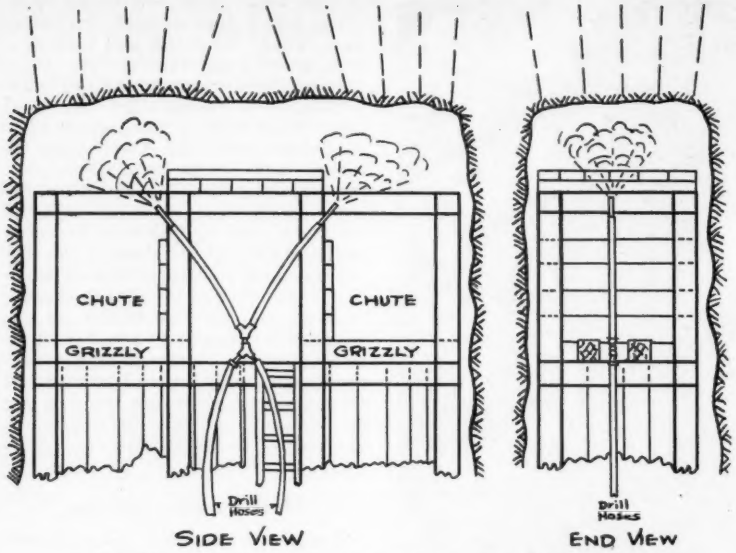


Fig. 9. Mist spray "fogger" controls dust in a three-compartment raise

(1) Relation of dust dissemination to water flow through rock drills
(2) Control of dust from blasting by a spray of water mist
(3) Effect of angle of drilling on dust dissemination.

Collaring holes dry is considered a serious offense and a worker is liable to discharge for such infraction.

Ventilation Data

All dead-end headings require auxiliary ventilation when advanced more than 25 ft. Approximately 3,000,000 cfm is circulated through the Butte mines. During a somewhat normal operation, the weight of the air circulated in a day is approximately 20 times greater than the weight of the total rock hoisted. The volume of air circulated in one minute is sufficient to sustain a human life from birth to the age of 21 years. During a capacity operation, it is sufficient to supply each man underground with more than 700 cfm.

During a full operation, approximately 1000 auxiliary blowers operate, blowing through more than 40 miles of air transmission duct. Air transmission duct varies in size from 12-36 in. in diameter. In one instance, a wood-stave duct of 38-in. ID is being used. The total horsepower on ventilation is approximately 10,000.

The standardized auxiliary blower is a single-inlet, safe-load, backward-curve-blade fan. The blower has a rated capacity of 3000 cfm at 6-in. H_2O static pressure. The blower wheel is mounted on the extended shaft of a 5-hp, 440-v, 3460-rpm, a-c induction motor.

Air Conditioning Cools Workings

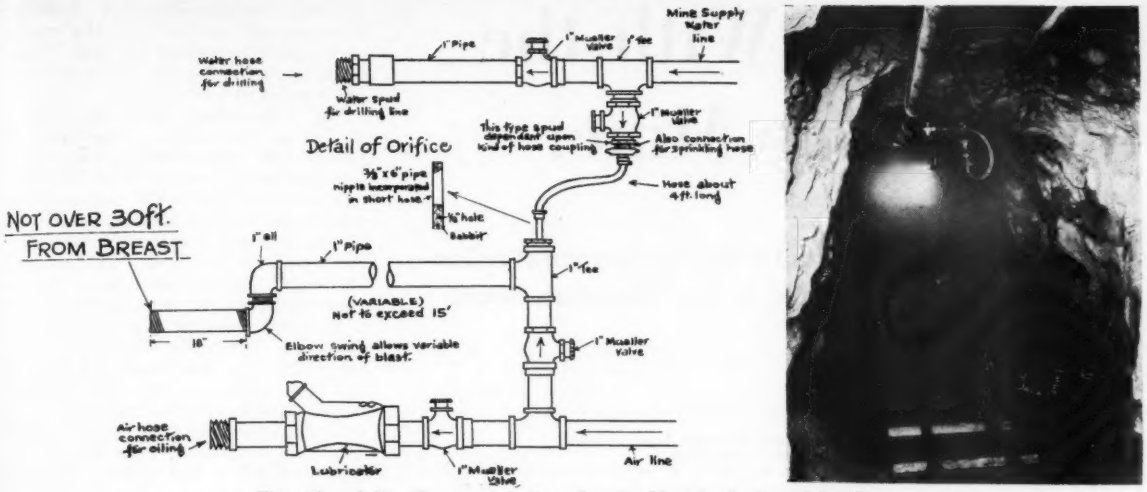
Many areas of the mine are ventilated by air conditioning. One system is at present servicing seven underground plants. These plants range in capacity from 20,000-70,000 cfm, and are of two types. The larger plants discharge conditioned air into the primary airways where auxiliary ventilation directs it through tubing to the various working headings. The smaller plants deliver the conditioned air through tubing direct to the working faces.

Each plant consists, in general, of a fan blowing through an enclosure containing an air-washing and an air-cooling chamber. Considerable dehumidification occurs in the air-cooling area which is accomplished by counter-current flow of water or brine solution inside of high-pressure, extended-surface heat absorbers with the air stream on the outside of exchanger surface.

The cooling medium circulates in a closed tube system from surface cooling towers to the underground plants. In the summer months, the surface cooling towers utilize an ingenious method of cooling water to below the surface, wet-bulb temperature. Due

Fig. 10. Wetting down dust near the shaft collar

Fig. 11. Shaft sprays successfully allay dust



Figs. 12 and 13. Compressed air and water blast for horizontal headings

to the arid nature of the surface atmosphere, a relatively low dew-point temperature exists. This is utilized in a precooling chamber, reducing both the sensible and wet-bulb temperature of the surface atmosphere before direct contact with the cooling medium in the surface towers.

The dehumidification from each of the larger underground air-conditioning plants often approaches 8 gpm and as a result, is a vital and all-important factor in reducing any dust concentrations which pass through the plants. The dust extraction through the air-conditioning plants approximates 60 percent. The refrigeration effect from this air-conditioning system will approximate 1200 tons of refrigeration per day as a yearly average.

The quality and cleanliness of the delivered air from the underground plants is of such high standard that a high percentage of recirculation is possible. Thus airflows result that are far in excess of what the mine ventilation system is capable of economically passing.

Various Control Methods

Sprinkling tanks for wetting down long, dry haulageways have been successfully used. The tanks are mounted on trucks and transported by motors.

Mine water service lines are provided with intermittent connections for wetting down where necessary.

Many tests have been made with hygroscopic salts for dust control. The salts were applied both in dry and solution form. The effective life of the applied salts does not warrant their use for general practice.

Sprays have many applications in the dust control program. Various types are used in dry manways, at chute mouths where the rock stream tends to dry out rapidly, and at permanent positions in airways and haulageways.

In 1936, the U. S. Bureau of Mines, in cooperation with the Anaconda company, made a dust survey of the Butte district. Ten trained men were actually engaged in the collection and quantitation of samples. The survey extended from February to June. Subsequent surveys made by the Anaconda company continue to confirm the results obtained by the Bureau.

Minerals' Debt to Man

Before a luncheon meeting of the 1950 annual meeting of the Colorado Mining Association, John D. Sullivan, Battelle Memorial Institute, turned the commonly accepted theory around to develop the thesis that, were it not for man's ingenuity, mineral lands would go begging.

Mr. Sullivan stated, "we have two standards of living, a fundamental one based on such commodities as food and clothing, but on this we have a superimposed standard more of the luxury type, which makes our living standards higher than those of past ages, and which makes that of the United States greater than that of most of the rest of the world. This secondary standard is based on consumption of mineral products. You can have ten times as much income and you will eat or wear but little more, but when your income goes up, you get mechanized mines and smelters and you get household conveniences, automobiles, radios, television sets, and what not, all of which are symbols of mineral consumption If you plot per capita calorific consumption of foods or pounds of clothing used in the U. S. against time in the modern era, you have virtually a straight line, although national per capita income has increased—and I mean not inflated dollars but dollars corrected to the purchasing power of, say, the 1935 dollar. However, if you plot mineral consumption against time, you find an enormous increase which roughly parallels national income."

Although we do not have mineral deposits of the same grade as 25 years ago we utilize ores of lower metal tenor or use other metals or mineral products depending on which at the moment is most economical. In 1890 the average recovery of copper from all ores in the United States was about 5 percent, while in 1946 it had fallen to 0.9 percent. Formerly, 5—7 percent of lead was required. Now current operations in southeastern Missouri are on ores containing as little as 2 percent of recoverable lead. Similarly, in 1906 no concentrates of iron ore were shipped from the Mesabi range, while in 1948 nearly 26 percent of Mesabi range ore was concentrated, usually by a simple gravity washing operation.

Looking to the future Mr. Sullivan stated that "the future of the mineral industry depends on the quickened mentality of man. . . . We must depend on new tools . . . for hard to find deposits. . . . It behooves the mineral industry to study intensively in the laboratory and in the field the basic fundamentals of the synthesis of minerals, rock alteration, and the relations of these to secondary enrichment. If this is done scientifically, in another 25 years minerals now in the ground but undiscovered will owe an additional debt to man."

Operating With the Continuous Miner

A Comprehensive Account of the Application of a Continuous Mining Machine to the Pittsburgh Seam

By W. E. HESS

General Superintendent, Vesta-Shannopin Coal Division,
Jones & Laughlin Steel Corp.

CONTINUOUS mining is in the experimental stages at the Vesta-Shannopin mines due to the many work interruptions of 1949. Also, the continuous mining of the Pittsburgh seam with its overlying draw slate entails problems that are not encountered in other seams and localities.

It is essential to strive for high recovery in the Pittsburgh seam because of the coal's high metallurgical qualities, its proximity to its destination for ultimate use and the diminishing reserves of coal with these qualifications. In order to realize maximum recovery, a continuous mining machine must be flexible enough to extract pillars under a system designed to facilitate this process. Whether to take the draw slate down with the machine and load out the total product, or to mine under the slate leaving a small amount of coal at the top to exclude the air and endeavor to hold the slate by timbering, is a problem of major importance, especially in development work. It is most important to leave as much slate as possible in place in the retreat of rooms and extraction of pillars. This procedure produces a better product for the cleaning plant and eliminates handling undesirable material.

Average Area Selected for Test

To determine the adaptability of the "Continuous Miner" to the conditions under which it would have to work, an operating area was located that had all the characteristics that could be expected in future mining operations. Roof conditions in this area provide a definite problem, as can be seen from the columnar sections shown in Fig. 1. Experience had taught that working places driven on the faces were subject to severe pressure and frequent falls. This condition called for extensive timbering although the cut-throughs driven on the butts stood much better. This area, especially in advance work, liberated methane excessively and required a closely controlled ventilating current in sufficient quantity to allow continuous operation of the machine.

A territory between two face entries was selected for the installation of

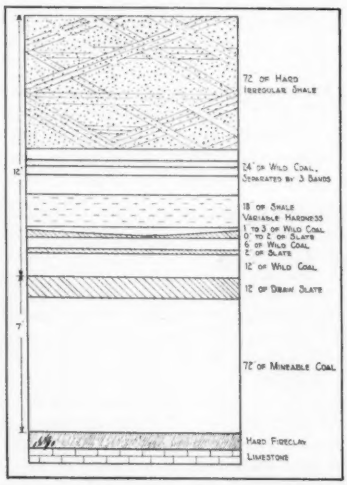

7Z OF HARD IRREGULAR SHALE
24" OF WILD COAL, SEPARATED BY 3 SANDS
18 OF SHALE VARIABLE HARDNESS
1 TO 3 OF WILD COAL
0 TO 2 OF SLATE
6 OF WILD COAL
2 OF SLATE
12" OF WILD COAL
12" OF DRAW SLATE
7Z OF MINEABLE COAL
HARD FIRECLAY
LIMESTONE

Fig. 1. Tender draw slate overlies the coal

the "Continuous Miner." Since this area had been started with track-mounted equipment, the track was removed from the advance entries. The number of entries to be driven was decreased from five to three for four reasons: (1) To speed development; (2) to provide as much solid coal as possible for the machine on retreat without crossing entries that had already been driven; (3) to facilitate control of ventilation; (4) and to provide a roadway for shuttle car haulage that would eliminate the necessity of running through doors or curtains. An overcast was built at the mouth of the butt to permit the use of two splits of air and place all shuttle-car haulage on the intake air.

Fig. 2 shows the change in the plan of driving the entries. The distance between the center lines of the entries was increased from 80 ft to 105 ft to provide more coal when the machine was in position to load. In addition, it was thought that better roof control could be provided. The centers on which cut-throughs were to be made was changed from 112 ft to 100 ft to conform to the plan of turning rooms on 25-ft centers from the haulage entry. As the number of entries had been decreased from five to three to maintain a separate return on each side which would be positive and which would not permit any interruption, an additional place was driven on each side of the haulage entry where the loading points were to be established on 400-ft intervals.

Because working places driven on the faces were subject to severe pressure and frequent falls, it was decided as an experiment to change the projections so that most of the room work could be driven on the butts instead of driving all rooms on the faces. Accordingly, the last two rooms on the left side of the entries were not driven and the third and fourth rooms were driven with the haulway being maintained in the third room. In addition, the third room is maintained as the intake and the fourth room is maintained as the return.

Plans for total extraction of this coal are shown in Fig. 3. It is proposed to drive rooms on 25-ft centers. The rooms are to be 13 ft wide and the 12-ft pillar will be recovered on retreat after the room has been driven to its limit. Rooms are to be driven 200 ft to permit rapid advance and retreat. It is hoped that it will be possible to hold the draw slate in the butt rooms to be driven and over the 12-ft pillar to be extracted.

Roof Poses Problems

While driving the face entries, considerable difficulty was experienced in maintaining the roof intact where pick-ups were driven from the main haulage and at the point of intersection of the pick-ups with the entries parallel to the haulage. Heavy bridge bars would be bent to the extent that equipment could not get under them. This necessitated taking down some roof, or the roof would break and fall resulting in heavy timbering jobs and the slowing down of loading operations and advancement while falls were cleaned up. As a result of this experience the plan of advancement of entries was devised as shown in Fig. 4 to eliminate all bridge timbering. This is possible as the machine is working only one place at a time.

When the middle or haulage entry

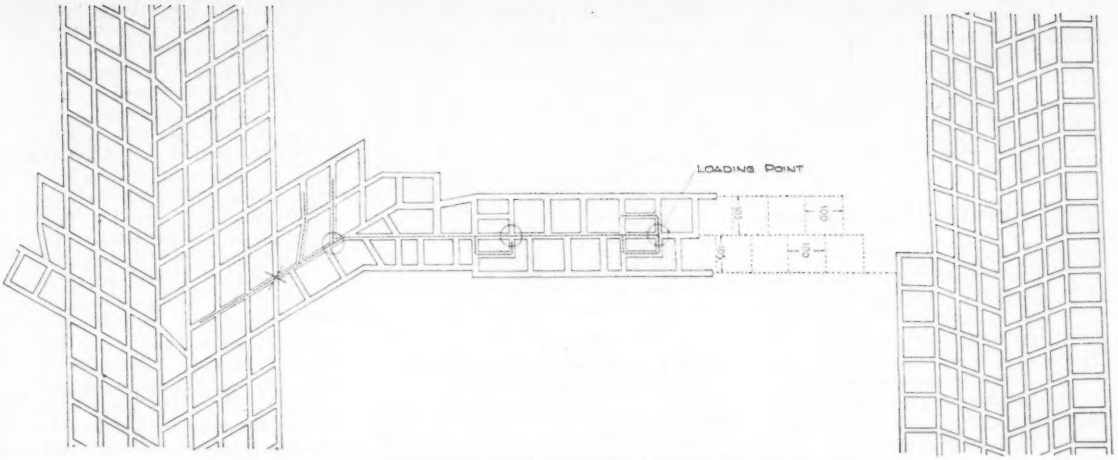


Fig. 2—The entry-driving plan showing changes to obtain better roof control

has advanced to the point where the cut-through is to be started, the haulage entry is stopped and the machine is turned to the right or left as desired. Timbering is then fanned around to protect the top; the cut-through is driven across to the return on either side of the haulway, and the return is advanced to the point where the next cut-through will intersect it when driven. Some difficulty has been experienced in maintaining the cut-throughs until this point has been reached as places driven on the faces undergo extensive pressure. By the time the point of intersection of the return and the next cut-through has been reached, the haulway in the cut-through is showing extreme signs of distress. There have been occasions when the machine had to be withdrawn before the point of intersection was reached. Then, more driving from the next place turned was required. This is the principal reason for changing to the driving of the cut-throughs on a 90-deg angle from the haulway instead of a 60-deg angle as it permits driving to the right or left from the point of intersection with the return entry.

Immediately upon completion of the driving of the return to the desired point or after the withdrawal of the machine if required, the working places were center posted with two rows of posts. This method of stopping the haulage entry has an important bearing on the ventilation system.

The haulage entry has been timbered with 7 by 9-in. wood crossbars set on 2½-ft centers. Crossbars are kept within 9 ft of the face as it advances, thus providing protection for the operator while the machine is working. Although this amount of timbering may have been excessive at times, no chances could be taken with an uncertain roof condition when the continuous operation of the machine is dependent on the absence of roof falls and on the maintenance of the haulway. The amount of timbering does reflect, however, in the production time lost during the timbering portant to be absolutely free of falls in the returns, some portions of the returns were timbered with 5 by 7-in. crossbars set on 4-ft centers.

Roof Bolting Considered—Not Adopted

Roof bolting has been considered in conjunction with the operating cycle of the "Continuous Miner" for the following reasons:

(1) The length of time the entries will have to stand before the panel is extracted
(2) The possibility of roof falls as the result of the weakening of wood timbering by dry rot
(3) The flexibility of shuttle-car haulage in the absence of timbers
(4) The excellent results of roof bolting which are being obtained in a near-by section of the mine.

However, the idea of roof bolting

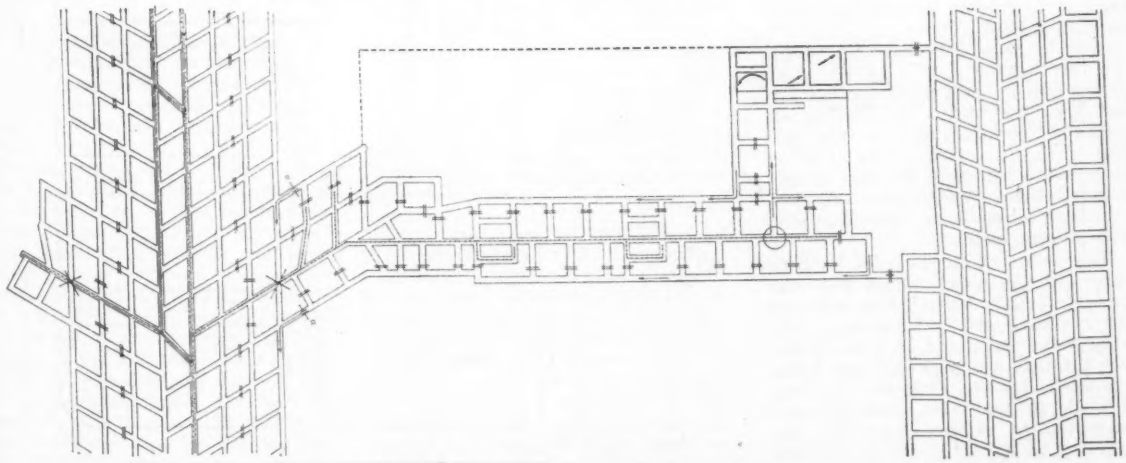


Fig. 3—Total extraction plan for mining the 72-in. coal

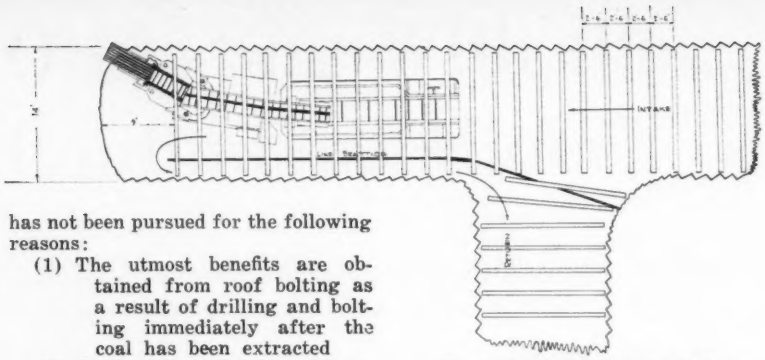


Fig. 4—Entry advancement scheme eliminates bridge timbering

has not been pursued for the following reasons:

(1) The utmost benefits are obtained from roof bolting as a result of drilling and bolting immediately after the coal has been extracted

(2) To bolt immediately upon extraction of the coal would require longer periods of delay than is required for conventional timbering

(3) More men are necessary on the operating crew

(4) The Pennsylvania Department of Mines requires conventional timbering where roof bolting is done at the working faces

Although a great deal of credit for the top conditions that have prevailed on this section have been attributable to good timbering, it must be remembered that there was no shooting of the draw slate against a tender roof condition. It is quite difficult, in practice, to drill all holes so as to keep the end out of the overlying coal strata. Even the slate became firmer and considerably harder as the entries were driven by the "Continuous Miner."

Ventilation Clears Gas

To supply a constant flow of air to the working face, a split of 15,000 cfm was provided for the "Continuous Miner" section. This was to be split right and left at the top end of the haulage entry and could be regulated to provide 9000 cfm to the working side and 6000 cfm to the other side.

Better vision for the machine operator is obtained by positioning the line brattice to confine the return to the restricted area. Thus all dust not settled by sprays is diverted behind the line brattice. The provision of 15,000 cfm for this particular section has been the means of diluting all methane liberations and no interruption in the operation of the machine has been experienced because of gas accumulations. The returns on either side have never at any time exceeded 0.15 percent methane.

The method of stopping the haulage entry, at the point where the cut-through is to be turned, does not permit any dead end in advance of this point to be ventilated by a line brattice through which shuttle car haulage would travel. Only the last cut-through to the right and left are permitted to remain open for the coursing of the air in the entries and all other cut-throughs are permanently stopped with concrete blocks as soon as the advance cut-through is made from the haulage to the return side. This procedure decreases any possible leakage that might develop if permanent stoppings were not immediately installed. All line brattices are advanced as soon as the place has been timbered. Thus the line brattice is never more than 9 ft from the advancing face. The possible use of jacks at the working face to put up the last timber was considered. However, as the line brattice must be kept so close to the face, the permanent posts are installed on the line brattice side when the place is timbered. This system relieves the timbermen of the necessity of going behind the line brattice while the machine is operating.

Draw Slate Handling

A tender draw slate varying in thickness from 12-16 in. overlies the Pittsburgh seam. On exposure this draw slate weathers, causing a bad roof condition if left in place. It is considered good operating practice in all haulways, and in locations where hauling must be done, to take the draw slate as the coal is mined. As the "Continuous Miner" was to be the only piece of loading equipment in this particular section, it was necessary to determine whether or not the machine would be capable of taking the entire seam, including the draw slate.

The method of leaving this slate supported by timbers was tried in the early stages of the installation but was not successful. This occurs because places driven on the faces, such as cut-throughs, are subject to undue pressure immediately after they are driven from the haulage into the return. As the entries advanced from the point where the draw slate was shot in the regular course of track-mounted loading operations, the slate became more firm and increasingly more difficult to take. The "Continuous Miner," as it cuts through the slate, tears the slate loose in large flakes and does not have the grinding action that was expected.

Taking the entire seam has not increased the percentage of minus 1 in. material mined, but rather has increased the percentage of plus 1-in. material when the entire product of the cut is considered. Since the slate chips rather than grinds, it does not have a tendency to get into extremely fine sizes. A comparison between the product loaded by the "Continuous Miner" and material prepared and loaded by conventional track-mounted equipment gives the following data:

Full seam, track-mounted machines, 52.4 percent plus 1 in.

Coal under slate, continuous miner, 24.0 percent plus 1 in.

Full seam, continuous miner, 30.8 percent plus 1 in.

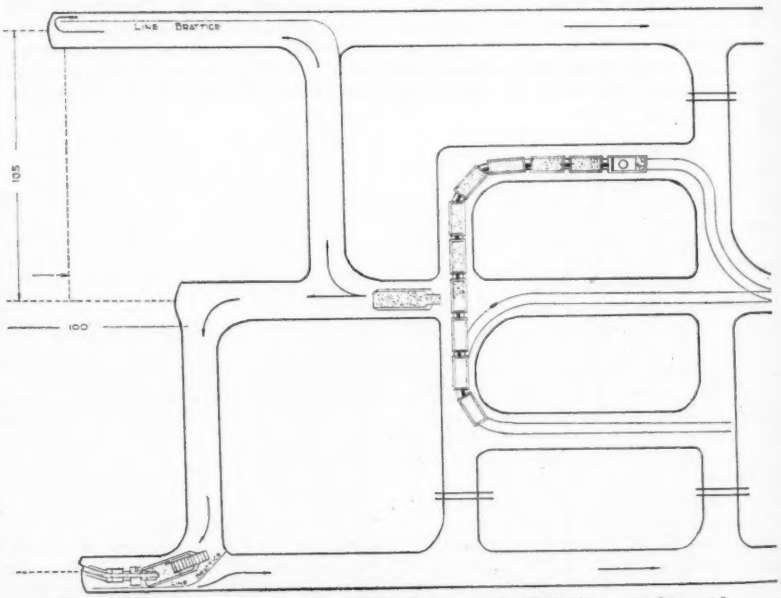


Fig. 5—Ventilation scheme splits 15,000 cfm to supply 9000 cfm to working side

Full-seam mining has been rather severe service for the "Continuous Miner." More maintenance has been needed than that required by machines extracting coal only. Full-seam mining has increased bit consumption considerably and the constant attention of maintenance crews is required to insure correct bit settings. Close attention must be exercised in the setting of the extreme outside bits in order to insure the proper clearance required for the initial sumping operation. Chain wear, and in particular the two outside chains, has been increased due to the shock when cutting slate.

Slate Falls Difficult to Load

When the machine was installed, it was utilized to drive two curves each approximately 400 ft long to provide a connection between the main haulway and a new haulway then under construction. These curves were located in an old portion of the mine and crossed several old entries in which the slate had fallen or, if it was not down, would fall in large pieces. The "Continuous Miner" was not very efficient in the loading of the slate in either case and, in most instances, it was necessary to break the slate by hand for loading. This was one of the principal reasons for dropping the number of entries on the development section from five to three.

Prior to the resumption of operations in early March, the continuous mining had been working two shifts per day with the third shift being devoted to the maintenance and to some clean-up in the working area. The chief sources of mechanical delay with the machine were burst hoses due to the high pressures, the failure of hydraulic cylinders and jacks and broken cutter chains. Since these failures might occur at any time during either of the two operating shifts with the machine remaining idle until repaired and since it was desired to try a new method of cleaning in the working places with the hope of realizing more rapid extraction and increased production from the machine, the third loading shift was instituted. To date, this is experimental and no definite decision can be reached concerning its advisability.

The "Continuous Miner" is not easy to transport from section to section or from the section to the shop. The width of the machine and the gauge of the caterpillar treads require a special skid or carriage, hence, most repairs must be made on the section. The weight of the component parts, the absence of any material-handling equipment, the necessity of transporting to the machine any welding and cutting equipment and the lack of necessary repair parts, unless large stocks are carried on the working section, combine to make repairs somewhat of a problem.

When the machine is not operating for any reason, the entire cycle is at a standstill and production ceases. With other types of mobile loading equipment it is possible to procure a replacement unit and continue loading operations. If a breakdown of the tramming mechanism of the "Continuous Miner" occurred when pillars were being extracted the safety of the machine would be imperiled. Should the breakdown occur early in the shift, considerable labor expense would be incurred without appreciable gain as the productive effort of the individual worker is not as great when occupations are changed. There is also the increase in operating costs when production ceases since the associated facilities such as haulage, ventilation, tipple, etc., are geared to take care of normal production from the machine.

Close Supervision Possible

As operations of the "Continuous Miner" entails working only one place at a time, it is possible to provide close supervision of the working place and all of the personnel working on the section. Since there is always a potential hazard in any working face because of the rapid advance, particular attention must be given to the following:

(1) The roof conditions for possible loose or bad roof and the immediate timbering of the place

(2) The possibility of encountering gas feeders if clay veins should be met

(3) The erection of the line brattice to keep the intake air sweeping the working face in order to provide good visibility, to remove any dust which may be held in suspension, and to dilute any methane which may be released

(4) The proper rock dusting of the working places to allay the dust hazard

(5) The supply of sufficient water at a pressure to give an effective spray system on the machine

(6) The proper alignment of the place and the turning of places on time and where projected

There is every reason to believe that the accident rate on sections operating with the "Continuous Miner" should be lower than those employing any of the conventional systems as all operations are under constant supervision.

Two shuttle cars are employed to move coal away from the machine. One car acts as a surge bin during loading operation while the other car shuttles between the working face and the discharge point where its load is discharged directly into mine cars.

Due to its cutting action, the machine throws considerable dust into suspension. Originally, the machine had spray heads installed in and around the cutting head to spray water directly into the coal as it was mined. This arrangement was not satisfactory as it did not allay the dust. Several fog sprays of flat sheet design were mounted on the sides and top of the machine so that the product was completely enveloped as it was being mined. These fog sprays required considerably less water than those used in the original spray installation. Water pressure on the section varies between 150-175 psi.

While the machine is still in the experimental stages, it has proven its adaptability to work under exacting natural conditions. The machine requires changes in several vital points to make it less vulnerable to breakdowns and to insure its continuous operation. The "Continuous Miner" is a forward step toward the answer to the economic problem of the coal industry which has resulted from higher wages and from the short productive day.

Coal-Mine Safety Records

Three safety records were set by the American coal mining industry in 1949. Both the fatality rate and the number of coal-mine deaths were the lowest in history, and 1949 was the first full calendar year to pass without a major coal-mine disaster.

The combined fatality rate for all coal produced in 1949 was 1.24 per million tons—lowest in history and a 19 percent drop from the former low of 1.54 in 1948. Director James Boyd of the U. S. Bureau of Mines also pointed out that the bituminous-coal death rate in 1949 was 1.15 and the anthracite rate was 2.18 per million tons—both new low records.

According to preliminary injury statistics, 593 men were killed in coal mines during 1949. This represents the lowest number of fatalities on record in the two branches of the industry, and 417 fewer miners killed than in 1948.

Also during 1949, fewer American coal miners received nonfatal injuries —about 38,200, or at the rate of 79.97 per million tons of coal produced.

In metal mines and open pits, 90 men were killed and 6800 injured, as compared with 101 deaths and 7515 nonfatal injuries in 1948. In nonmetal mines and quarries, 80 deaths and 6100 nonfatal injuries occurred during 1949.

Bureau of Mines statistics for 1949 are based on estimated production of 477,664,000 tons of coal.

Ore conditioning and sintering plant of the Tennessee Coal, Iron and Railroad Co. at Wenonah, Ala.

The Beneficiation of Southern Iron Ores*

Part I of a Concise Survey of the Metallurgical Means of Extending the Reserves of the Birmingham District

By E. H. ROSE
Research Engineer
Tennessee Coal, Iron and Railroad Company

ALABAMA accounts for about one-eighth of the total iron ore production of the United States, and 90 percent of it comes from underground mines on Red Mountain adjacent to Birmingham. Although, at the present time, only one of the four iron ore producers in the Birmingham district practices beneficiation in the sense of applying mineral dressing procedures for the elimination of silica ahead of the blast furnaces, the need to do so is steadily increasing and most of the producers and the U. S. Bureau of Mines have research programs under way.

The so-called Red Mountain formation is some 200 ft thick. Commercial production has come almost entirely from the Big Seam. Several other beds of ferruginous material are present but are either too thin to be economically minable or too low grade for direct furnace use. The Big Seam, which is in the Clinton formation, outcrops in workable grade and thickness along the crest of Red Mountain for a distance of about 20 miles in a southwesterly direction from Birmingham. Near the surface, it dips from 15-20 deg to the southeast and flattens out to about 10 deg at present mining depths. The chief mining operations today are under 1000-2000 ft of cover and some are as much as two miles from the mouth of the slope. The ultimate limits of the seam down the dip have not been determined.

The Big Seam ranges in thickness from 10-22 ft. At the southwestern end, it contains enough lime to be self-fluxing, but there is a pronounced trend to high silica and lower lime progressively toward the northeast end, where the excess acidity (silica-plus-alumina-minus lime) rises to 12 percent. In this area, the lower 4-6 ft of the seam is prohibitively high in silica for direct furnace use and is not mined.

Overlying the entire area of the Big Seam, and 50 ft above it, is a seam of ferruginous sandstone about 30 ft thick. Exploration of this seam has been spotty but on the basis of drilling, an iron content of 22-24 percent is indicated, with about 60 percent acid constituents and only a trace of lime.

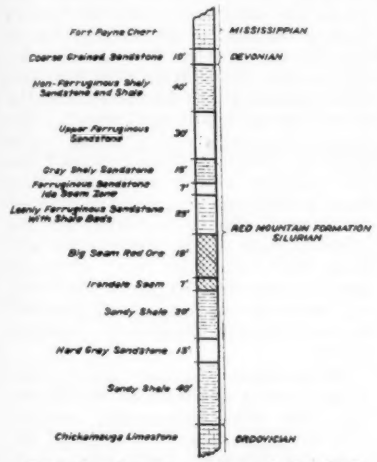
The sandstone seam outcrops at surface and initial mining depths would not be excessive but, because of the dip, little would be accessible to open-pit mining. In some areas, the sand-

* Adapted from a paper presented at the Birmingham meeting of the American Iron and Steel Institute, October 1949.

stone seam has been subject to some caving from Big Seam mining operations below.

It is physically feasible to beneficiate sandstone to an attractive grade of concentrate with satisfactory recovery. Whether or not it can be done at permissible cost remains to be demonstrated.

The foregoing conditions then answer the question: "Why beneficiate Red Mountain ores?" The reasons are: (1) To offset the trend toward higher silica ores; (2) to utilize that portion of the Big Seam ore not economically minable at present; (3) to endeavor to utilize the virgin ferruginous sandstone seam which, despite its leaner tenor, is a thicker bed and



Typical columnar section of the Red Mountain formation in the Ishkooda area

accessible at shallow depths; and (4) gain reprieve against the day when deep vertical shafts will have to be constructed to gain access to the lower extensions of Big Seam ore.

That being the "Why?" the immediate question is "How?" For better or for worse, the mineralogical structure of the ore itself, either Big Seam or ferruginous sandstone, dictates a number of the elements in the process. When one addresses himself to these and prudently bears in mind that Nature cannot be expected to abrogate any of her laws for his special benefit, the field narrows down, but a logical procedure can be envisioned.

The Nature of the Ore

From the purely mineral dressing viewpoint, the acid Big Seam ores and the ferruginous sandstone are essentially alike in physical structure. The silica in both occurs preponderantly in two forms: First, as separate, discrete, water-rounded sand grains which at some geological time were true beach sand; and second, as a kaolin-like inherent clay so highly dispersed through the hematite that it has not been satisfactorily identified

Here an outstanding metallurgical engineer presents an analysis of the iron ore reserve situation in the Birmingham district. Forceful reasons are presented for undertaking the beneficiation of readily available low-grade material. The various means by which this may be accomplished are discussed. This first part discusses gravity concentration, flotation and electrostatic separation and their application. Other processes are treated in Part II which will be published in a subsequent issue of Mining Congress Journal.

and probably can never be eliminated satisfactorily by beneficiation. The iron mineral in both ores is a soft earthy hematite, which tends to become "paint" upon the slightest abrasion, especially when wet. In the sandstone, the individual silica grains are imbedded in the continuous matrix of non-crystalline, clay-containing hematite. Big Seam ore, being oolitic, has similar structure but with the added feature that the sand grains may be and frequently are surrounded by alternate shells or veneers of clay, calcium carbonate, and hematite, in addition to being imbedded in the general hematite matrix. Calcium carbonate is also present as discrete particles in the Big Seam ore but is almost totally absent in sandstone. Both ores carry some fragmentary particles of chert, usually a quarter inch or smaller in size. In both seams, thin parting layers of shale or slate are occasionally encountered. An attractive feature of the ferruginous sandstone is that it carries only about a fourth as much phosphorus as Big Seam ore.

The sand grains of the several classes of ore range from 20 to 100 mesh in size. The Big Seam grains tend to be uniform throughout the seam. In the ferruginous sandstone there is a definite tendency for the grain size to decrease progressively from north to south end of the bed.

These ores are the reverse of the Lake Superior ores or taconites in two respects of fundamental importance to the problem of beneficiation. First, the hematite is much softer than the silica and is also softer than the hematite of most of the Northern ores. Second, as mined, the silica to be eliminated exists as separate grains rather than being continuously intergrown. Yet both require mechanical liberation of the individual components before a separation can be made. These two differences pose a radically different outlook.

In Northern ores the hematite shows less tendency to slime. Consequently upon proper hydraulic classification, the finer, lighter silica overflows and can be discarded as waste, while the relatively more granular hematite can be recovered in tractable form.

If Red Mountain ore of any class were accorded the same treatment as Northern ores, the hematite would slime at once and, being of higher gravity than the silica, could not be made to overflow a classifier without

Mechanized loading in an iron ore mine where the roof is supported entirely by bolting

carrying along silica considerably coarser than itself. Even if means were found to make the separation economically, we still have the opposite of the Northern problem in that it is the valuable mineral that has been slimed, imposing a severe dewatering problem and, beyond that, the problem of reaggregating it into a form suitable for blast furnace use.

Since the silica to be eliminated is in the form of separate grains held together only by the soft hematite-clay cement, there is no fundamental reason why the sand grains should be reduced in the milling process if a grinding device of sufficient discrimination could be applied. In other words, what is required is an abrasive action just sufficient to rub the soft hematite away from the sand grains without breaking them.

In the laboratory, this can be done. But it has yet to be accomplished satisfactorily in units approaching commercial size. Even, however, if a perfect selective grind were attained, an upper limit of 49-50 percent Fe is imposed upon the grade of the resultant slimes. This is because of the inherent clay previously mentioned which is present in the ratio of about one part clay to each four parts of hematite. The same is true of any larger grains of sand-free hematite that might be recovered without sliming, for that is simply the constitution of the mineral.

Furthermore, the clayey hematite, when wet, holds its moisture tenaciously and in the slime condition after wet processing cannot be reduced below about 25 percent moisture by any method except thermal drying.

The foregoing, then, are the physical conditions imposed by the nature of the ore. The problem of the mineral dresser is to thread his way through them, taking maxium advantage of those that are favorable and not taking any steps that would give undue play to the others.

Possible Methods of Concentration

The known concentrating processes already in use which conceivably might apply are:

(1) Gravity concentration, including Heavy Media separation
(2) Froth flotation
(3) Electrostatic separation
(4) Magnetic Separation
  (a) Direct
  (b) After reduction roasting

Of the above processes, gravity concentration is the only one to have had a full scale commercial trial in the district. Therefore, in endeavoring to evaluate in advance which of the several processes offers the most promise of ultimate general adoption for the utilization of the silicious ores of the district, the best one can do is

The Mardun laboratory disintegrator with end plate removed

to examine them separately in the light of the known properties of the ores. How is each of them affected by the inescapable propensity of the hematite to slime? If selective grinding cannot be perfectly achieved, is one process more handicapped than another by the resultant finer sizes of silica and the "upside down" nature of the classification problem? Assuming that a satisfactory separation is made, does the concentrate from any one process promise advantages over another in the matter of dewatering and converting the concentrate into something fit for blast furnace use?

Gravity Concentration

Since the specific gravity of hematite is about five and that of silica less than three, a gravity separation is theoretically possible on Red Mountain ore.

For any method of concentrating, it is axiomatic that the component minerals to be separated must be physically severed from each other. Since, in this case, the sand to be eliminated has a maximum size of 20 mesh and ranges down to 100 mesh, it follows that separation cannot be made at any coarser size. Also, unfortunately, gravity concentration is not satisfactory in most cases for particle sizes finer than about 100 mesh, because high specific surface brings in adverse effects.

This at once rules out the elimination of sea sand by the Heavy Media process, which is not economically effective on sizes much finer than ¼ in. Considerable Heavy Media test work has been done on Big Seam ore. The purpose, however, was only to scalp out such larger lumps of gangue as might be present as the result of roof falls, miscellaneous small parting seams, etc. For that limited purpose, Heavy Media treatment has been shown to be reasonably effective. However, in simple truth, this constituted the elimination of material most of which should not have been present in the first place. In some of the mines of the district, the difficulty has been remedied at the source by changing over from conventional timbering to the recently developed method of roof bolting. Dilution from that source is no longer a problem.

In the size range where concentration is desired to be effective on these ores, namely 20-100 mesh, it can be said at once that the success of gravity methods will be proportional to the selectivity of the grind. Any sand grains inadvertently ground finer than 100 mesh will report in concentrate and dilute it proportionally. Any hematite not ground or abraded free from the sand will either be lost in tailing or dilute the concentrate if recovered. Gravity concentration depends upon close sizing, which in this case encounters the handicap that the finer mineral is also the heavier. The choice of gravity concentrating equipment for this size range is limited and its capacity low in terms of either time or floor space. A large area of thickeners will be required for the slime portion of the concentrate and final filter cake will carry about 25 percent moisture. A given plant will be limited to one type of ore and will be vulnerable to changes in character of ore.

Nevertheless, the one concentrator in the district operating on Red Mountain ore does successfully employ gravity concentration, the plant design and flowsheet being such as to minimize as far as possible the inherent perversities of the ore.

To do this, the ore is dry crushed to ¼ in. and then ground in lightly-

The Mardun disintegrator is designed for abrasion grinding. Laboratory tests have been made with this equipment on Ishkooda ore

loaded rod mills in closed circuit with eight-mesh screens to minimize over-grinding. The screen under-size is then deslimed in bowl classifiers and the slime accepted at once as final concentrate for thickening and filtering. The bowl classifier sands are hydraulically classified into eight size bands and each fraction is separately treated on shaking tables, of which there are 64 in the plant. These tables recover such granular hematite of acceptable grade as may be present, reject a final tailing for discard and yield a large cut of middling for re-treatment. This is passed through a rod mill regrind circuit and thence back to the concentrating circuit. By maintaining a large circulating load, the danger of overly severe grinding is avoided.

The granular table concentrate is relatively easy to dewater but the slime concentrate is reported to amount to about 500 tons per day from 1500 tons of ore, requires two

ing would add to the slime production for dewatering, which the law of diminishing returns does not permit.

In the case of ores such as these, many attempts have been made to work out scrubbing devices capable of taking advantage of the unequal hardness of the components. These have taken a variety of forms, but the basic principle is usually the agitation of fairly finely divided ore in a confined space, so that the individual particles are caused to rub or collide against each other. These are generally called fluid energy mills. In another version, the finely divided ore is rubbed between partly yielding surfaces, such as rubber, which are in differential motion. The object is to strike a light blow and multiply the number of blows enormously. Usually such devices may operate either wet or dry. Operating wet requires large volumes of water to be accelerated to high speed at heavy consumption of energy. If operated dry, the ore must be bone

TABLE I
AIR CLASSIFICATION AND WET TABLING OF MARDUN MILL PRODUCT

(a) *Ishkooda Outcrop Ferruginous Sandstone*

Product	Weight, Percent	Assay, Percent Fe	Assay, Percent Insol.	Distribution, Percent Fe	Distribution, Percent Insol.
Composite Dust	38.66	48.2	26.1	65.8	18.1
Table Concentrate	13.79	47.6	24.8	23.2	6.1
Table Middling	13.85	11.0	82.1	5.4	20.4
Table Tailing	32.59	3.4	94.2	3.9	55.0
Table Slime	1.11	44.9	20.4	1.7	0.4
Calculated Feed	100.00	28.3	56.1	100.0	100.0
Combined Dust and Table Concentrate	52.45	48.1	25.8	89.0	24.2

(b) *Coarse Ore, No. 14 Ishkooda Mine*

Product	Weight, Percent	Assay, Percent Fe	Assay, Percent Insol.	Distribution, Percent Fe	Distribution, Percent Insol.
Composite Dust	47.63	44.9	14.3	60.8	26.5
Table Concentrate	15.47	49.8	12.4	21.9	7.5
Table Middling	20.80	21.2	38.8	12.5	31.5
Table Tailing	12.98	7.0	65.5	2.6	33.2
Table Slime	3.12	25.3	10.5	2.2	1.3
Calculated Feed	100.00	35.2	25.6	100.0	100.0
Combined Dust and Table Concentrate	63.10	46.2	13.8	82.7	34.0

145-ft thickeners and three 10-ft ten-disc filters to reduce the moisture to 25 percent. Thus dewatering equipment constitutes a disproportionately large part of the total plant outlay.

The grade of slime concentrate is maintained at 42 percent Fe, as compared with the 49-50 percent theoretically possible. From the viewpoint of avoiding fracture of the silica grains, that is acceptable performance. From the viewpoint of liberating iron from the silica, a compromise has been necessary. The sand concentrate is held up to 46-47 percent Fe where the same 49-50 percent is theoretically possible, but at the expense of losing into tailing some attached iron that could have been liberated by further grinding. However, the further grind-

dry and not moist, a condition not common in Alabama.

One such selective grinding device that was developed a few years ago for cupriferous sandstones in Arizona is the Mardun mill, which is being studied by the Salt Lake City Branch of the U. S. Bureau of Mines. This is really a version of the conventional hammer mill, designed for abrasion grinding.

A test run was recently made in a laboratory unit of this type on both Big Seam ore and ferruginous sandstone. The fine dust was accepted as final concentrate and the sand wet-tabled to recover granular free hematite. The results are shown in Table I where it will be noted that on sandstone 90 percent of the iron was recovered at 48.1 percent Fe grade which approaches the maximum theoretically attainable in the presence of inherent clay. On acid Big Seam ore, the corresponding figures were 82.7 percent Fe recovery at 46.2 percent Fe grade.

It must be remembered that these results were attained in a small laboratory unit. One cannot be optimistic that wear and power characteristics would be favorable in a commercial-sized unit or that the fine dust collection in such volumes would be feasible. The results are presented here not as a prediction of things to come but to show what is believed to be the best that has ever been achieved, even in the laboratory, in the gravity concentration of Red Mountain ore, for later comparison with other processes.

For the gravity concentration of Lake Superior ores, several new types of classifier have been offered in recent years but none can be regarded as satisfactorily applicable to Red Mountain ore except in a limited sense because of the ever present condition already mentioned—slimed hematite of heavier gravity and higher specific surface than the coarser silica. It is probable that this condition will also rule out the use of Humphreys spirals. Jigs are another old stand-by in the gravity concentration field but they are not applicable to fine sands. There have been recent attempts to develop high frequency vibrating jigs to work in the 20-100 mesh range, but so far without notable success.

In simple fact, if a selective grind could be achieved such that the problem is one of separating plus 100-mesh silica sand from minus 100-mesh hematite according to size, a device would be required which is independent of specific gravity. There are instances of successful use of screens for sizing at 65-mesh and recently under-water screens have been developed which are said to be practical at 100-mesh but the outlook is not economically good for their use on iron ore.

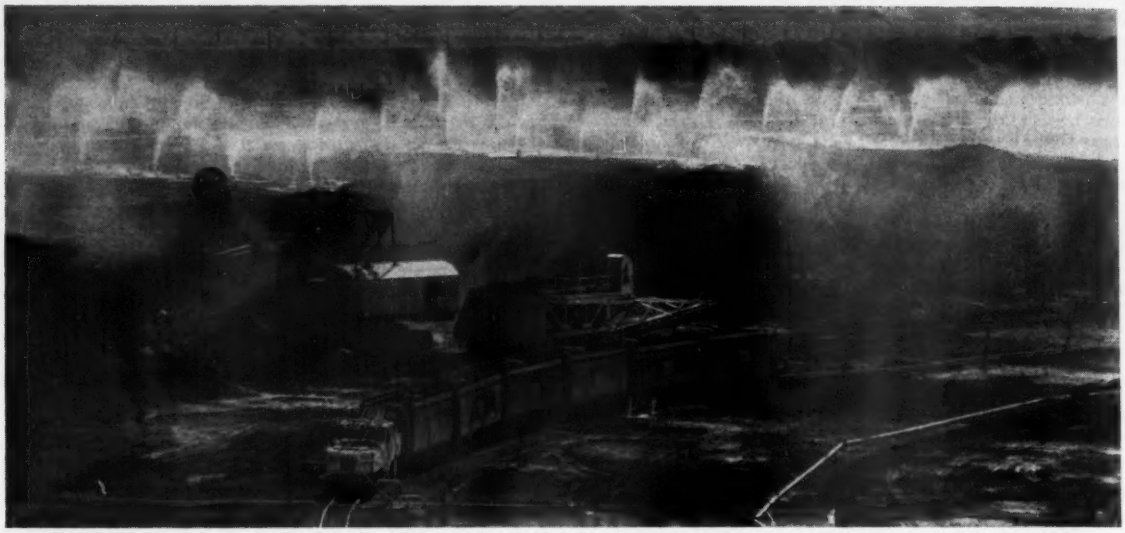
Froth Flotation

It has been demonstrated on a small scale under precisely controlled laboratory conditions that silica can be floated away from the hematite contained in the Red Mountain ores. The Bureau of Mines has published results using such methods on Big Seam ore.

Various reagent combinations have been used and the concentrate made showed approximately 90 percent recovery of the iron, 60 percent of the lime, and rejection of about 67 percent of the insoluble.

The methods used compare with those commercially developed for some of the nonmetallic minerals, but the reagent costs at the present time are so high as to make the commercial application doubtful.

(*Continued on page* 60)



The Yallourn open-cut on the Latrobe Valley lignite field. Constant spraying is a precaution against coal dust fires

Australian Lignite Mining

By JOHN LOUGHLIN

IN the sparsely settled Latrobe Valley, 90 miles east of Melbourne, Australia, plans are going forward for the establishment of a new industrial region based on the existence of 19,000,000 tons of brown coal already proved by drilling. The huge deposits are situated in a flat-lying seam averaging 200 ft in thickness and reaching a maximum thickness of 560 ft. It is claimed that the brown coal, or lignite, is more accessible by open-cut mining than any other deposit in the world, as the overburden is seldom more than 50 ft in thickness. In Germany, open-cut operations are conducted economically where brown coal seams 33 ft thick are overlain with 100 ft of waste.

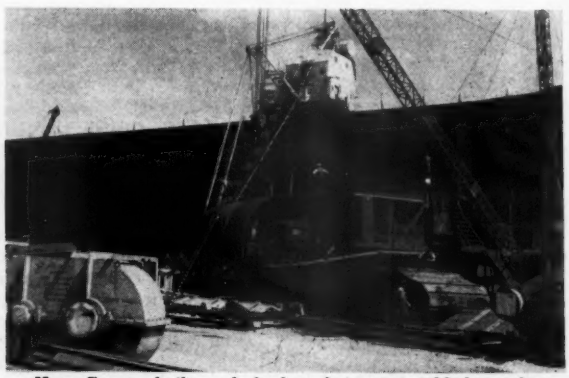
Currently, more than 60 percent of the power used in Victoria, Australia's principal industrial state, is being generated in the Latrobe Valley field in a power station at Yallourn. Coal is won by means of two open-cuts from a brown coal deposit extending over 30 square miles. The main cut—a 600 acre operation—yields 6,250,000 tons a year for use in the power station and briquetting plant. It is said to be the second largest brown coal open-cut in the world.

Production from this field will be expanded to 10,000,000 tons a year. To do this, the two existing dredges now operating on the 90-ft coal faces, will be augmented by two new bucket-wheel dredgers recently purchased in Germany. The first of these has arrived and is now being assembled. Each of the new units has an output of about 500 tons per hour.

Another phase of the huge program, which will be linked with the new hydroelectric undertakings to form a power generating system to meet future needs of the rapidly growing industries of the area, is a new open-cut located six miles away in the same valley. There, earth-moving equipment has started to strip off the shallow 40-ft overburden to uncover an unbroken deposit of coal averaging 380 ft in thickness.

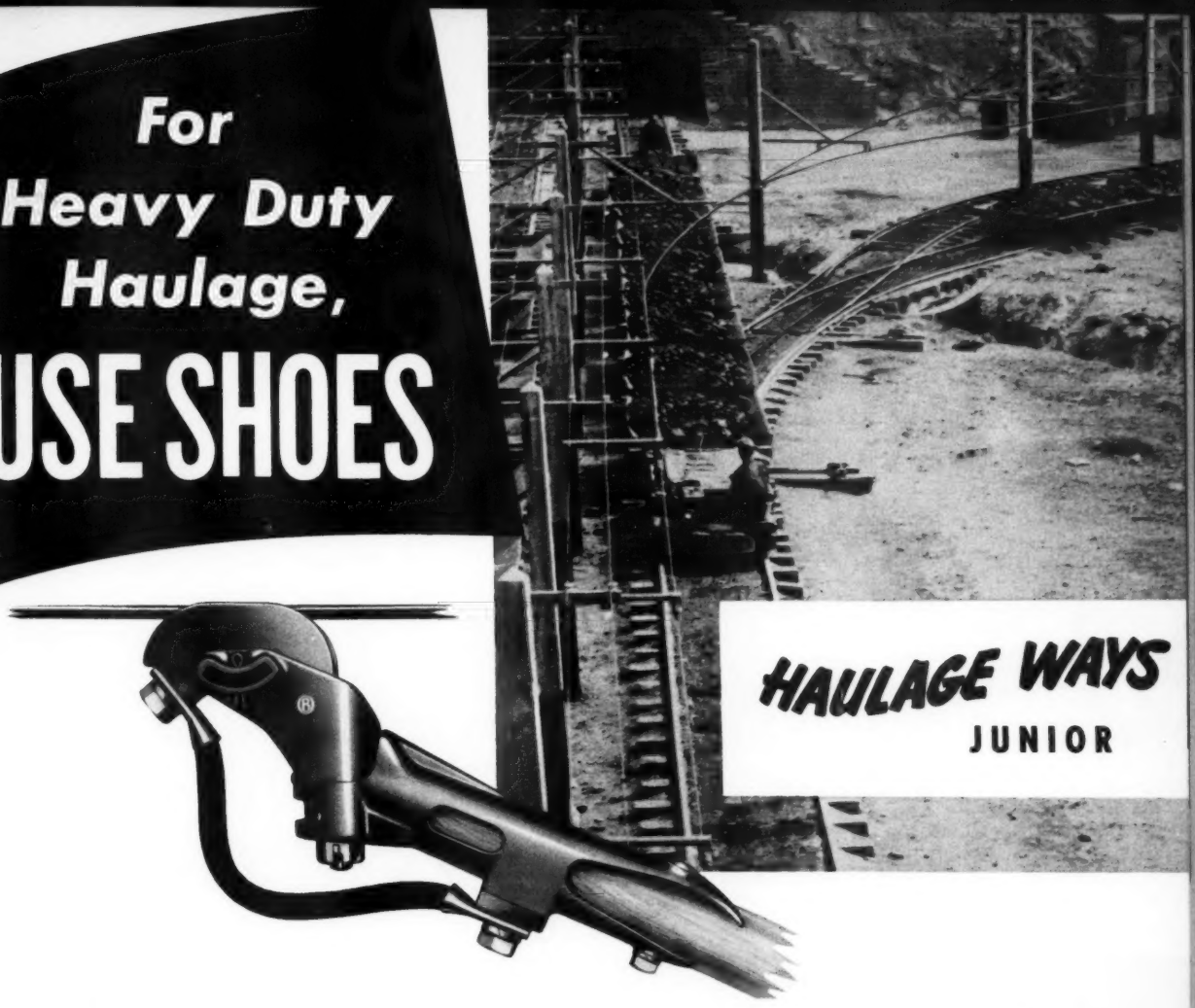
The plan for the industrial development of the valley has been laid out to obtain the maximum use of the abundant supply of fuel. Zones for new townships, industries, agriculture and forests have been prescribed, leaving the coal areas free for future exploitation. At present the population of the valley is approximately 19,000 but it is expected to grow to the 100,000 mark.

When the 40 ft of overburden have been stripped off, the 320-ft seam will be mined



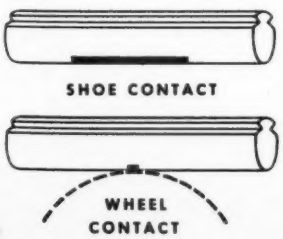
New German-built coal dredger being assembled on the Yallourn open cut is of the bucket-wheel type

For Heavy Duty Haulage, USE SHOES



● If you want a smooth, dependable flow of power from the trolley wire to the collectors of your main haulage locomotives, use a collector that presents the largest possible area to the wire. That's why shoes — O-B Type-L Trolley Shoes — are better suited to heavy duty haulage than trolley wheels. Here's the reason: Shoes, in the first place, do present a larger surface for current transfer than the wheels. Because of this, current passing from the wire to a trolley shoe passes through what might be called a "line" contact, as contrasted to the "point" contact between the wire and a wheel. An abrupt jog in the wire will break the contact between a wheel and the wire, interrupting the power flow. When this happens, there is a good deal of arcing, for the flow of current has been concentrated through a very small area. However, the current flow is distributed through a series of points in the case of the shoe, and since the shoe is less likely to break contact with the wire, the chances for power interruption and arcing are much less. You see, the pivotal center of the shoe is located in the center line of the wearing surface, eliminating any tendency for the shoe to tilt because of friction between the shoe and the wire. Further, a jog in the wire, while depressing the leading end of the shoe, will press the trailing end more firmly against the wire. The reverse is true when the center of the shoe passes the jog.

Your O-B representative will be glad to tell you more about the advantages of shoe current collection. Ask him what it can do for you in your mines.



Field tests show that under identical conditions of heavy electrical load, trolley shoes outlast wheels many, many times. This is because of reduced arcing and burning with the use of shoes. The sketches show the difference in surface covered by the wheel or shoe in contact with the wire.

Ohio Brass

MANSFIELD OHIO, U. S. A.

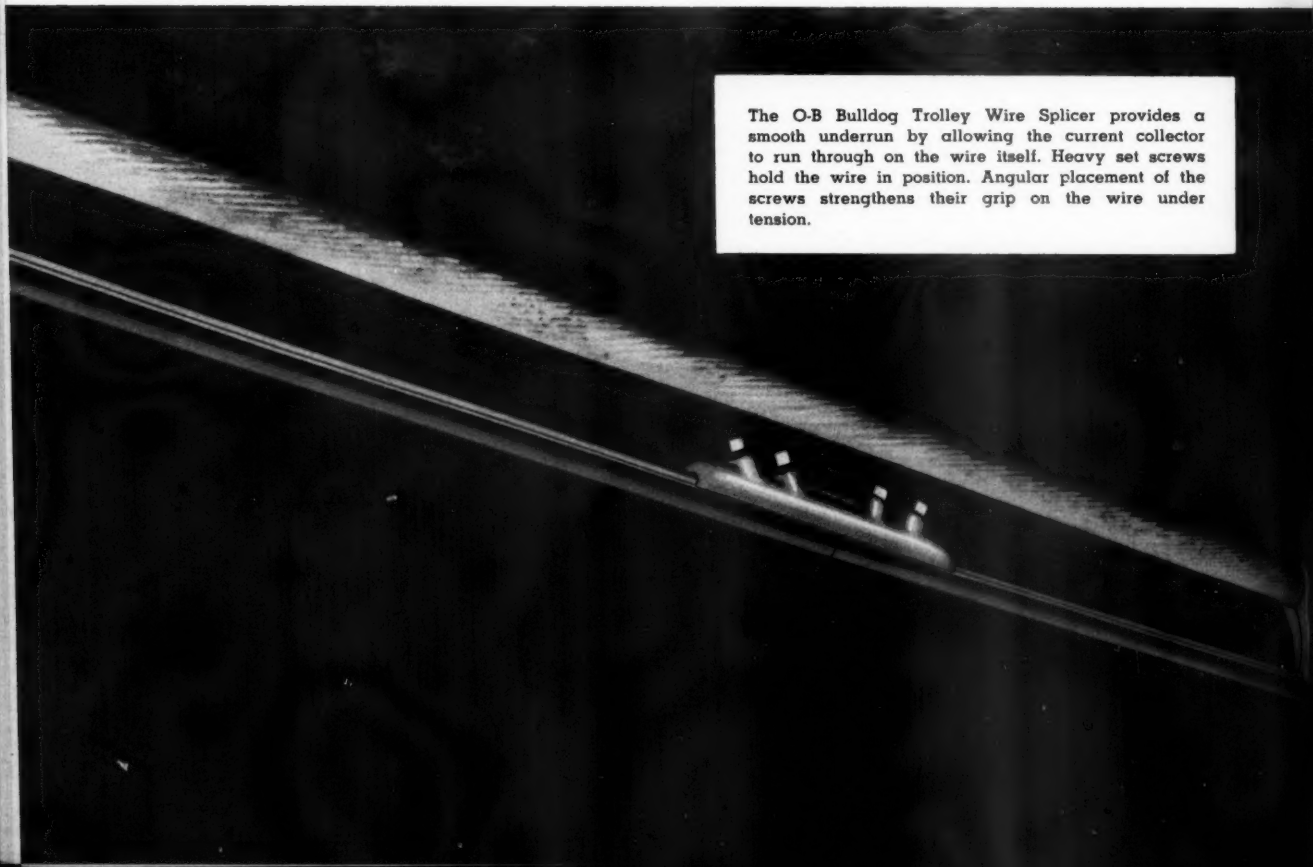
CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

HAULAGE WAYS

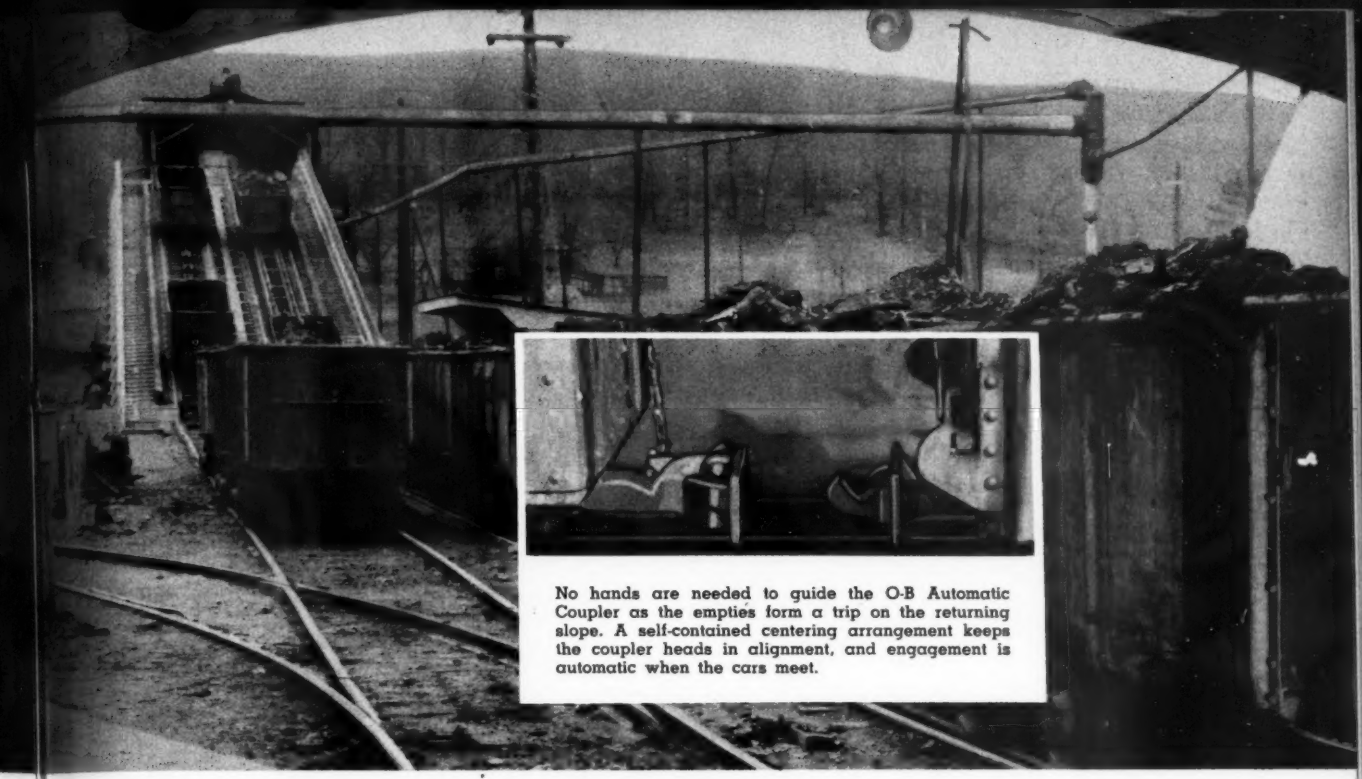
JUNIOR

For Coupling Cars or Splicing Wire

... O-B Dependable



The O-B Bulldog Trolley Wire Splicer provides a smooth underrun by allowing the current collector to run through on the wire itself. Heavy set screws hold the wire in position. Angular placement of the screws strengthens their grip on the wire under tension.



No hands are needed to guide the O-B Automatic Coupler as the empties form a trip on the returning slope. A self-contained centering arrangement keeps the coupler heads in alignment, and engagement is automatic when the cars meet.

Equipment Does it Best

● There's an important similarity of function between O-B Automatic Couplers and O-B Wire Splicers. It's a function that you need for smooth, speedy operation anywhere along the haulage way. It's the ability of each to make a secure, dependable connection.

For couplers, this is important. High speed haulage and dumping operations demand a coupler that joins positively on impact as well as one that eliminates dangerous slack between cars.

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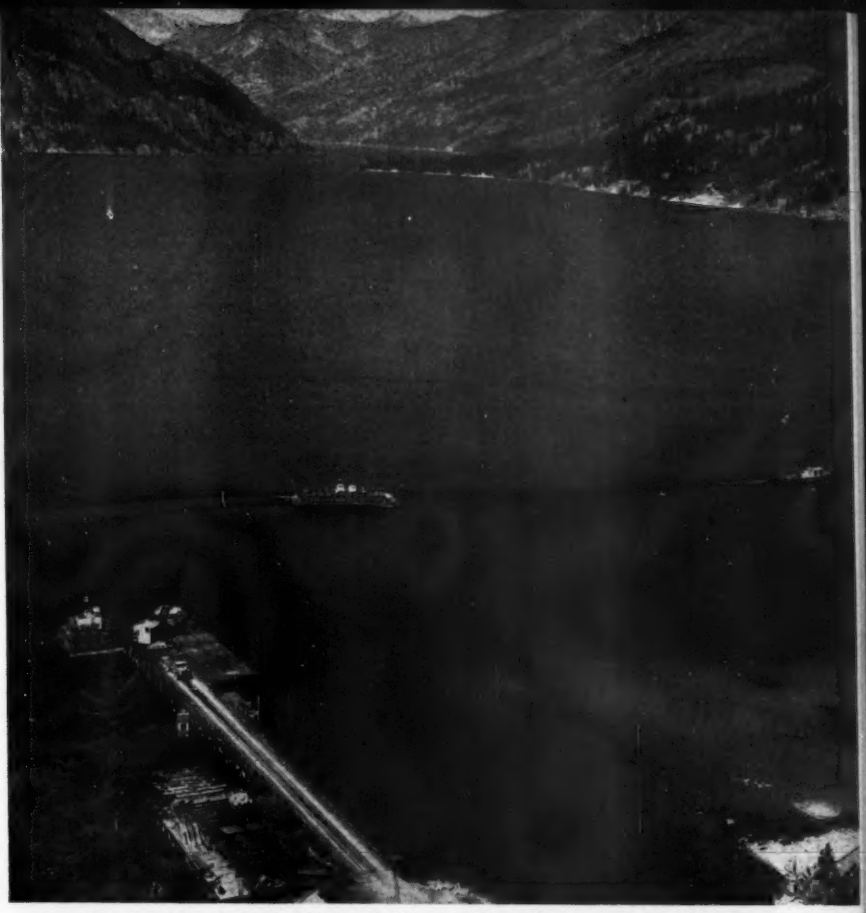
How the Flow of Essential Raw Materials from Mine to Consumer Depends Upon Integrated Ship, Rail and Highway Facilities



Copper concentrates from the Chelan division of Howe Sound Co. move down Lake Chelan enroute to smelter

Transportation and the Mineral Industry

By
DR. JOHN D. MORGAN, JR.*

INCREASING quantities of minerals, metals and nonmetallics are required in modern warfare as was vividly demonstrated by the World War II drain on these essential raw materials. In the course of moving from mine to factory, every mine product must be transported.

For example, copper ore produced from a western mine is transported by rail to a distant mill for concentration. Thence, the concentrate goes to a smelter where the contained copper is reduced to blister form. Further rail movement is required to move the copper to the refinery and then to the manufacturer. Bauxite comes by water from the Guianas to a Gulf Coast port for transshipment by barge or rail to inland locations for conversion to alumina. Then it is shipped by rail for conversion into metallic aluminum, which is moved by rail to the manufacturing centers. Every raw material has a flow pattern that depends upon transportation. For any given product water, rail, highway and air transportation may be utilized.

Wartime Shipping

As early as 1940, water shipping problems limited imports of chromite from Turkey, graphite from Madagascar and tungsten from China. In May 1941 the OPM organized a shipping section and, as the problem grew in importance, most of the Government agencies concerned with shipping cooperated in the formation of a committee known as the Interdepartmental Shipping Priorities Advisory Committee. Subcommittees of this group worked on special problems. Recommended were such actions as unloading Philippine ores on the west coast instead of the east coast, and dredging the Surinam River in Guiana to permit vessels to load a full cargo of bauxite without dropping down stream for a final topping off from lighters.

Despite the number of committees working on the problem, cargos of strategic materials from the Far East had to compete for space with cargos in the regular trade, such as tapioca and sugar. Nevertheless, imports of some strategic materials were materially increased as the impending war grew closer. For example, the following were imported:

	(Short tons)		
	1939	1940	1941
Manganese ore from the Philippines	3,900	24,400	30,800
Tin from the Netherlands East Indies	6,000	13,600	19,900
Tin from British Malaya	52,400	108,000	117,500

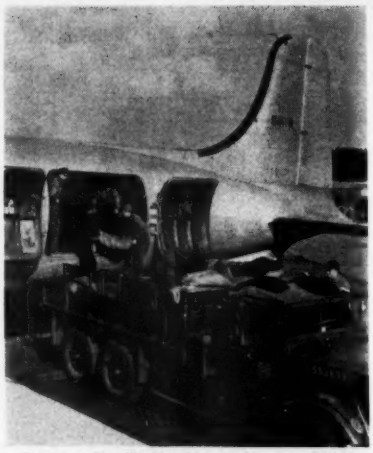
* With the Natural Security Resources Board, Washington 25, D. C. Opinions are those of the author and do not necessarily reflect official views.

Submarines Cut Imports

Although sinkings in the Atlantic reached a maximum in 1942, it was necessary to continue to import large quantities of raw materials into East Coast and Gulf Coast ports. Of 60 special ore boats used to haul bauxite from the Guianas to the United States and to Canada at the start of the war, 52 had been sunk by the beginning of 1943. Less satisfactory vessels had to be substituted. At the same time extensive bauxite development projects were started within the United States.

To eliminate experienced merchant crews, the U-boats sank shipping without warning and machine-gunned lifeboats. Such information was kept secret during the war to avoid alarming the American people, and to keep from the enemy knowledge of the success of the U-boat campaign.

In some fields the supply situation was critical. In 1942 the loss of a single ship carrying 3300 tons of strategic grade asbestos from South Africa required an immediate tightening of use limitations. From July to November 1942 no corundum ore was received in the United States from Africa, and the sinking of a vessel with 1400 tons of corundum led to limiting subsequent lifts to 300 tons per vessel, so that the loss of a few ships would not cut off the entire supply. The disruption of the oil-tanker movement along the East Coast required substitution of special tank-car trains, and subsequent pipe-line construction projects. Large quantities of minerals had to be moved through the Panama Canal to the East Coast since our needs were so acute in the first years of the war that we imported large quantities of copper, lead, and other ores from South America at a time when we could least afford to risk the required vessels.



During the Berlin blockade over 1800 tons of coal per day were moved by air

Critical Materials Moved by Air

Some minerals were in such short supply that air transportation was used to bring block mica, block talc, tantalite, columbite and corundum from Karachi, India, and Accra, Africa, to the United States, while industrial diamonds, block mica, quartz crystals, and tungsten were flown to the United States from Rio de Janeiro.

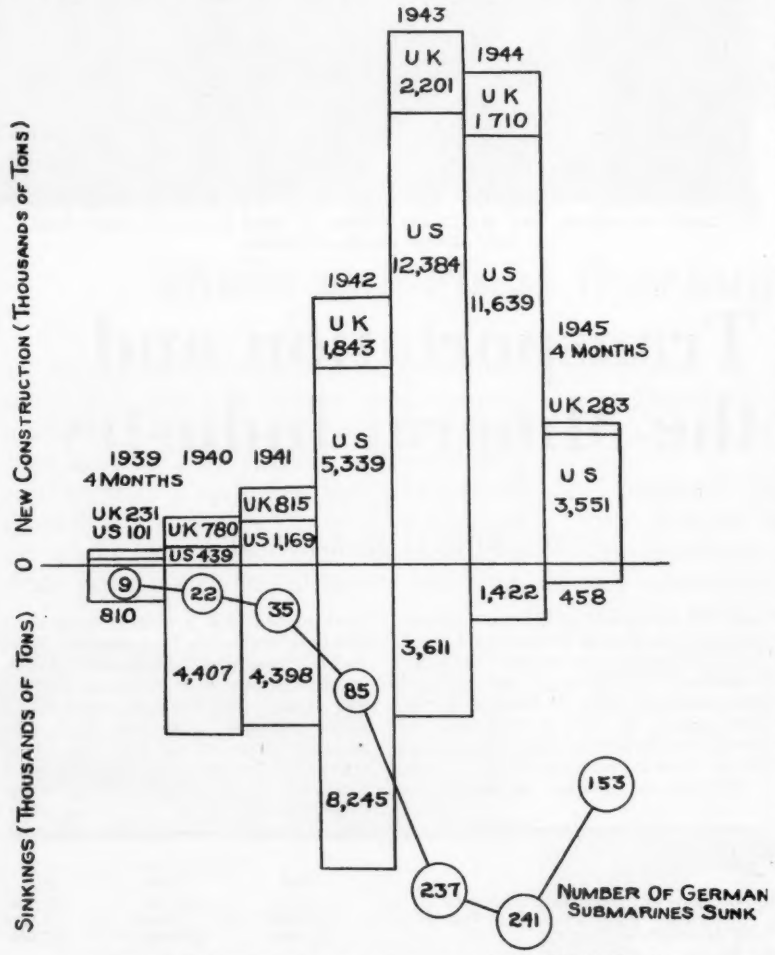
Of the major bulk minerals moving by water in 1942, most of the iron ore was moved on the Great Lakes, and a considerable quantity of the coal was moved on tributaries of the Mississippi River, especially on the Monongahela. The movement of the iron ore followed the pattern shown on page 62 of MINING CONGRESS JOURNAL for February 1950.

Iron Ore Bottleneck

Of greatest significance is the bottleneck of the Soo Locks, where at the start of the war there were only three locks. The vulnerability of the locks to attack or sabotage attracted the attention of transportation experts, but little was done until well into 1942. In the summer of 1942 it was planned to build ore docks and railroad yards at Escanaba, Mich., to handle 60,000,000 tons of ore a year should the Soo Locks be destroyed. To link the iron ranges with Escanaba, some 360 miles of railroad were also planned.

Some work was done on the roadbed and on the bridges but the use of heavy rails for regular railroad maintenance prevented laying track. Two docks were started at Escanaba in 1942 to be built to such a stage that they could have been completed within 60 days after the destruction of the Soo Locks. However, the Escanaba project was given only an A-4 priority (almost valueless at the time) and by the spring of 1943 the program was modified to call for the construction of only one dock at Escanaba, with a capacity of only one-fifth that of the Soo traffic in iron ore.

Meanwhile a fourth lock was finished at the Soo Canals. By the summer of 1943 the Escanaba project was abandoned, and later some of the material was salvaged. Interruption of



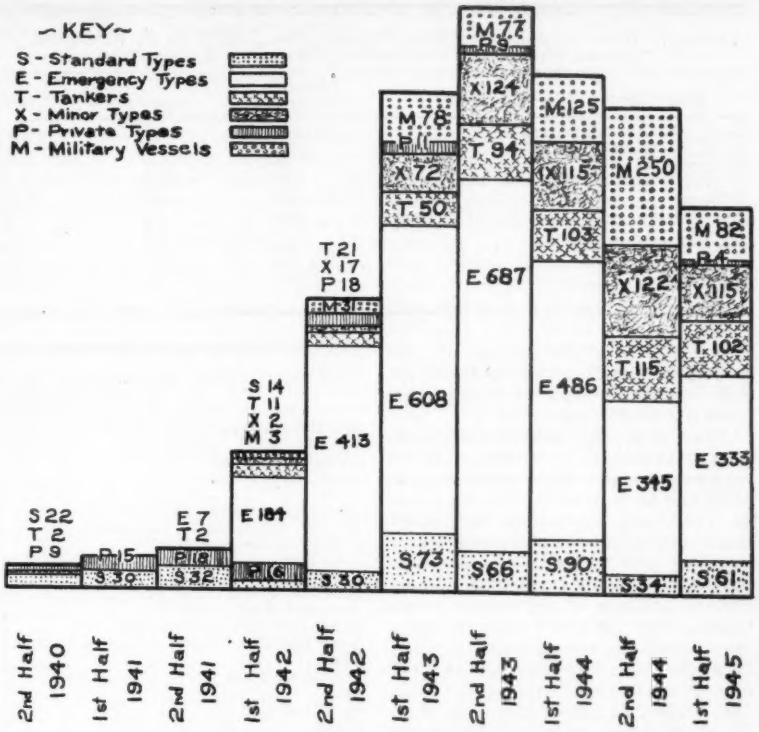
Vessels sunk compared to new construction during World War II

Lake traffic for any long period would have had serious consequences. At the discharge ports there was storage capacity for only about 30,000,000 tons of ore and up-lake coal trade would have been cut at the same time as iron ore movement.

The matter of increasing the Great Lakes fleet had fortunately received early attention. In March of 1941 the Navy contracted for the construction of five ore-boats to be used by companies making armor for the Navy. In the summer of 1941 the OPM announced a steel expansion program to produce an additional 6,500,000 tons of pig iron a year, whereupon the Iron and Steel Industry Advisory Committee recommended the construction of 19 new ore-carriers as soon as possible, and additional ones for the 1943 season.

It was decided to build a total of 25 vessels, of uniform design, and of 12,000-13,000 long tons capacity. The first was delivered in June of 1942, and a total of five were completed for some use during the 1942 season. Sixteen vessels were delivered in 1943 and the program was then terminated. The 1942 season was fortunately the longest of the war years, lasting 250 days. The lengths of subsequent shipping seasons were: 1943, 227 days; 1944, 234 days; 1945, 244 days. Icebreaking was recommended to open the shipping season earlier, so in March 1943 the keel of the *Mackinaw* was laid. This Coast Guard icebreaker of 5090 tons was launched in March 1944 and commissioned in December 1944.

Sinkings were reduced materially by the submarine hunting tactics of the Navy and convoying. Meanwhile, the



Vessels delivered under the United States Maritime Commission Program

U. S. embarked upon a major vessel construction program to make up for previous losses and to provide a merchant fleet of unprecedented size. The second half of 1943 was the peak period for delivery of new vessels under the Maritime Commission program. In August 1943 the shipping branch of the WPB reported that there no longer existed any justification for the use of uneconomic domestic facilities designed to save ocean shipping. In September 1943 the Joint Chiefs of Staff announced that a deliberate effort should be made to conserve domestic resources, relieve critical man-

Inland waterways are important to raw material transport

TABLE I. Water Movement of Major Mineral Commodities on U. S. Coastal and Inland Waterways During 1942—in Thousands of Short Tons

Commodity	Domestic Shipments	Imports	Exports
Coal, bituminous and bunker	123,800	200	18,200
Coal, anthracite	7,800	100	500
Copper, ores and concentrates	60	529	40
Copper, unmanufactured	297	220	36
Iron ore	101,000	900	2,700
Phosphates	472	11	542
Potash	23	13	2
Sand and Gravel	44,600	500	200
Stone	24,800		400
Sulphur	2,390	15	377

power shortages, and salvage internal transportation facilities by encouraging imports instead of encouraging domestic production.

From this point onward the expansion of the domestic mineral industry was not a matter of as great concern as it had been in 1942. Having failed to expand domestic mining materially, due to manpower and equipment shortages, we were forced to then make up our deficiencies by importing. Nevertheless, arrivals of dry cargos originating from off-shore sources never approached the record of 1941, when 26,000,000 tons had come in. In 1942 only 17,500,000 tons arrived; while in 1943 19,700,000 tons arrived; in 1944, 18,100,000 tons; and in 1945 19,400,000 tons.

Railroads Make Good Targets

During the war there was little increase in the number of gondola and hopper cars and car shortages were a recurring hindrance to several mining operations. Since 1942 was the year of maximum interference with ocean shipping, the railroad load in 1942 is of interest. (See Fig. 3 and Table II.)

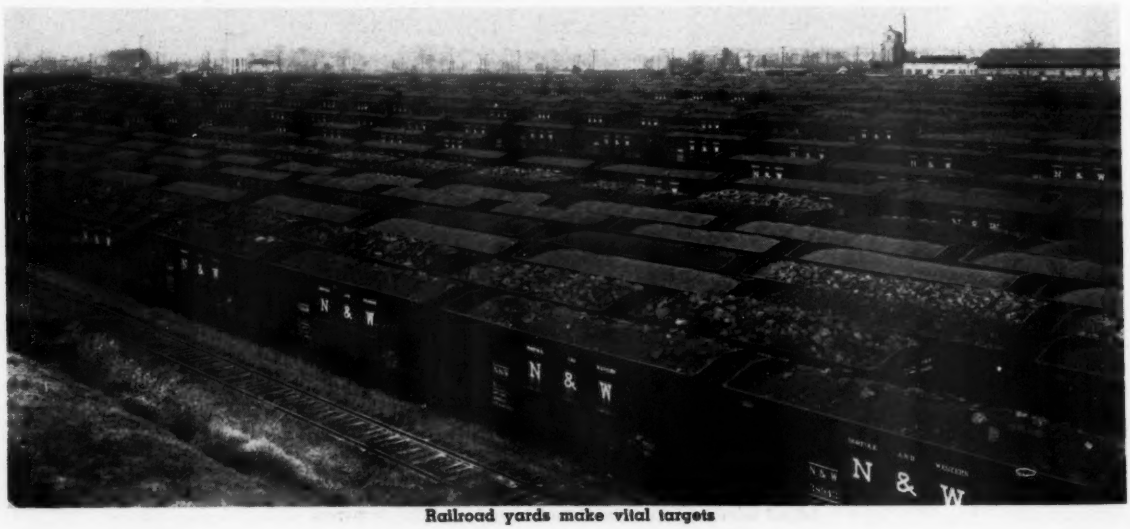
Inasmuch as there was almost no enemy interference with the domestic railroad system in World War II, it is necessary to examine the records of Germany and Japan to see what might have happened, and to get an idea of the vulnerability of rail transportation. The German railroad system (the Reichsbahn) was nationally managed and closely integrated with the military services. At the insistence of the German high command, equipment to service and repair steam locomotives had been retained in standby condition in areas that were electrified before the war. During most of the war the railroad was not a first-priority target for Allied bombing. However, the railroads were the standard alternate target because they were always near and easy to pick out. The United States Strategic Bombing Survey found that the greatest disruption per ton of bombs was accomplished, in decreasing order of effectiveness, by:

(1) Systematic line cuts at bridges, underpasses, and viaducts
(2) Hits at throats of yards and other choke points
(3) Hits on communications, including signals
(4) Hits on servicing facilities
(5) Hits on rolling stock and shop facilities—both of which must be accomplished to secure effective neutralization.

After October 1944 there was a great increase in coal stocks at German mines, despite declining mine produc-

TABLE II. Rail Movement of Major Mineral Commodities in the U. S. in 1942—Thousands of Short Tons

Aluminum, ingot, pigs, and slabs	347
Cement	(149,249,190 barrels)
Coal, bituminous	379,309
Coal, anthracite	69,350
Coke	22,412
Copper, ores and concentrates	1,562
Copper, ingot, matte, and pigs	1,454
Copper, brass and bronze	892
Iron Ore	112,000
Pig Iron	7,507
Iron and Steel, Class VI	12,194
Iron and Steel, Class V	45,503
Lead, ores and concentrates	673
Lead and Zinc, ingot, pigs, and bars	1,791
Lime	3,179
Phosphate Rock	6,300
Salt	3,801
Sand and Gravel	76,098
Stone	41,672
Sulfur	3,120
Zinc, ores and concentrates	3,129
Ores and concentrates, not otherwise specified	7,413
Products of Mines, not otherwise specified	50,656



Railroad yards make vital targets

tion, because the railroads were no longer able to move the coal away in quantity.

Japan also had a government controlled railroad system. The railroad was not selected as a first-priority target but the Strategic Bombing Survey concluded, after examination of all available sources, that concentrated air attacks on railroads and urban areas after March 1945 would have led to an earlier surrender of the Japanese and would have more effectively reduced their military capabilities to oppose our contemplated landing operations.

Coal had not been selected as a high-priority target because it was believed that there would have been too long a time-lag between the knocking-out of facilities and the time that the effect would have been felt in industrial production. Postwar study showed that such was not the case, and the final conclusion was that if we could have destroyed the rail and sea facilities for coal transportation we could have ended the war much sooner. Thus it may be concluded that, in a future war fought on the pattern of World War II, rail transportation nets would be prime targets.

Highway Movement Essential to Mines

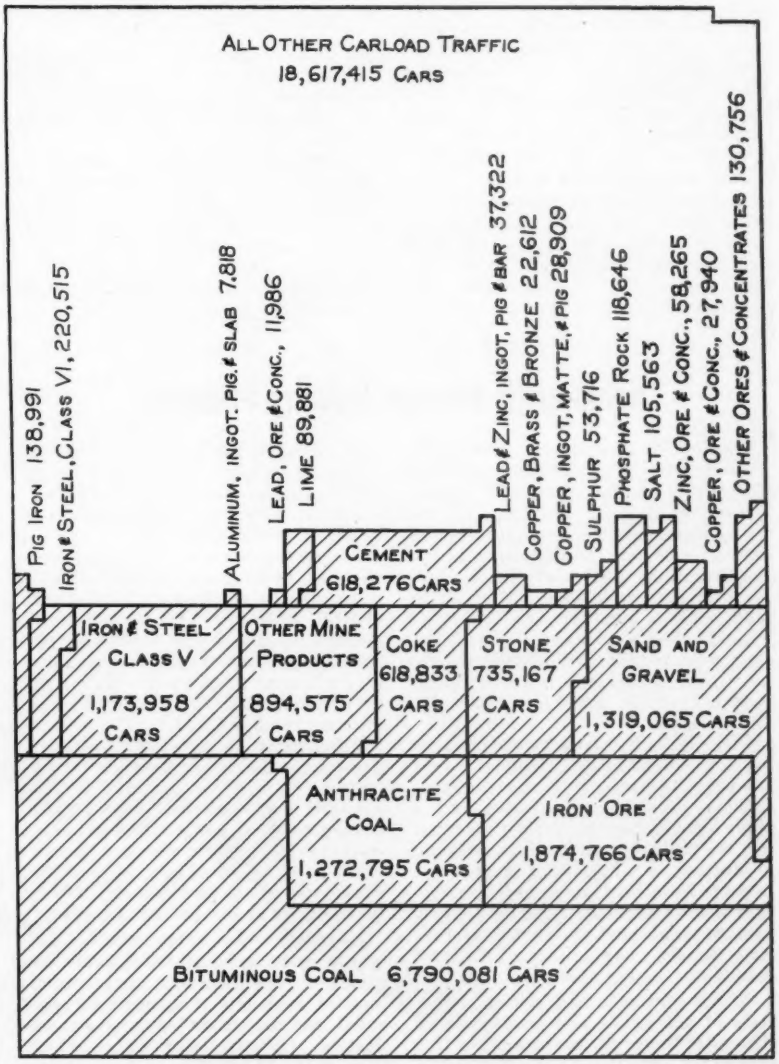
Mines require roads to enable the workers and supplies to be brought in by auto and truck, although railroad transportation is usually used to haul away the ore or coal. Before Pearl Harbor it was recognized that expansion of domestic mineral production would require additional roads. Accordingly, the Highway Act of 1941 authorized the Public Roads Administration to construct, maintain and improve access roads to sources of raw materials provided that the need for such roads was certified by the Secretary of War or the Secretary of the Navy. The Public Roads Administration considered the U. S. Geological Survey or the U. S. Bureau of Mines to be the agencies to confirm the need for access roads. Thus, the mine operator desiring an access road could file an application with the Geological Survey, the Bureau of Mines, the Grazing Service, the Forest Service, the Bureau of Reclamation, the Public Roads Administration, the War Department or the Navy Department.

There was considerable confusion and, as late as October 1941, nothing material had been accomplished. On December 1, 1941, $150,000,000 was appropriated for the access roads program. After Pearl Harbor all road applications that finally ended up in Washington, D. C., were referred to the Mining Division of the WPB for appropriate coordination. Finally, by April 1943, the district engineers of the Public Roads Administration were handling applications in the field. The shortage of construction machinery and the manpower shortage resulted in the expenditure of only $25,395,000 during the war, of which $11,304,000 was spent primarily on access roads in timber properties.

Truck transportation of minerals suffered many set-backs in the war. New trucks were almost impossible to obtain since military trucks were in great demand. Throughout the war only 1632 heavy trucks were released to the domestic mining industry.

In the early days of 1942 the Office of Defense Transportation adopted a regulation requiring that trucks haul 75 percent of their rated capacity on the return trip—a regulation which when applied to mined raw materials was impossible to obey. The ODT likewise required that the mileage traveled be reduced 25 percent over 1941, also obviously impossible to obey without cutting production by 25 percent at the same time.

One outstanding example of truck haulage over a considerable distance occurred in Nevada. Magnesium ore was hauled from the concentrator at Gabbs to the refinery at Las Vegas—a distance of 334 miles. In a five-month period starting in January 1944, 15 loads a day were hauled: a total of 4,500,000 ton-miles-per-month. To accomplish this task, special units costing $24,000 each were constructed. They were 70 ft long, Diesel-engine powered, mounted on 80 tires size 11 by 22 in. and they carried a 30¼-ton payload. Nevertheless, a consideration of the quantities of minerals hauled by rail or shipped by vessel demonstrates that the truck in wartime stands little chance of moving the major portion of the railroad and vessel tonnages.



Railroad cars of freight originating in the United States during 1942. Products of mines and unmanufactured metals accounted for 47 percent of the total traffic

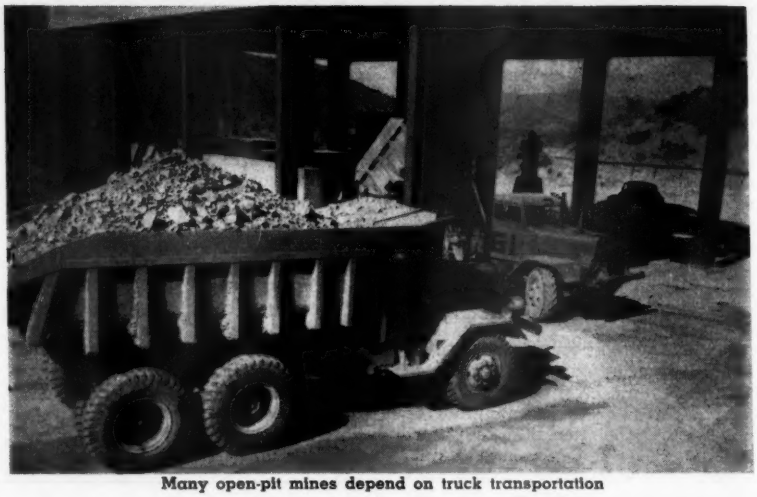
Conclusions

In World War II the United States was particularly fortunate in that only ocean shipping was affected by enemy action. However, our internal transportation net will also be a high priority target in the event of a future war.

When the minimum goals of the present government stockpile program are actually *on hand* there should be less need, in an emergency, for obtaining strategic and critical materials from distant and dangerous foreign sources. In the meantime, air cover and radar screens, and improved submarine hunting and convoy protection will be required to protect ocean shipping in war. The maintenance of our reserve fleet is also essential.

Domestic water shipping must be provided with adequate material-handling facilities, and excess capacity should preferably exist to meet emergency conditions. Critical bottlenecks, such as the Soo Locks and the Panama Canal, require special protection from surprise attack or sabotage. Sufficient vessels must be on hand to meet expanded wartime production schedules.

Rail transportation must be available to meet wartime needs. Vulnerability studies should be made with the least practicable delay covering bridges, viaducts, underpasses, and similar facilities. The construction of alternate facilities in peacetime should be given appropriate consideration. Consideration must likewise be given to the maintenance of reserves of critical items of rolling stock and motive power.



Many open-pit mines depend on truck transportation

In special cases, truck transportation can be of considerable value in moving mineral products. Air transportation of high-value, small-volume products is becoming increasingly feasible.

Integrated efficient transportation systems are an absolute requirement to supply the industrial complexes that make modern war possible. Conversely, the integrated transportation net of the United States offers many inviting targets for attack or for sabotage. Consequently, current mobilization planning for an emergency must make adequate provisions to strengthen and defend all the component parts of the transportation net to insure the prompt movement of essential raw materials, manufactured products, troops and military materiel.

Nonmetallic Mineral Industry Planning

Andrew H. Phelps, chairman, Nonmetallic Minerals Industry Advisory Committee of the Munitions Board, writing in the March 4 issue of the *Army and Navy Journal* outlines the objectives of his committee in advising the Munitions Board on the development of the industrial mobilization plan. The committee has under its cognizance asbestos, abrasive bauxite, corundum, industrial diamonds, graphite, jewel bearings, kyanite, mica, quartz crystals, sapphire and ruby, and block talc.

Included in the work of the committee is a review of all pertinent stockpile purchase specifications, recommendations on storage methods; and a study of the length of time required for the industry to reach maximum production in time of an emergency. Reports have been developed by members of the committee covering the various materials and reviewing the current supply, availability, uses and substitutes, where available.

Of the strategic and critical materials of the grade and quality being stockpiled under the cognizance of this committee, only three are produced at all in the United States. This means that prior provision for an adequate emergency supply take the form of stockpiling or the development of synthetic substitutes or new technology using alternate materials.

Research and development has been under way for some time to produce synthetic materials of strategic grades, such as radio-grade quartz crystals, mica, steatite and block talc, all highly critical materials used in electronic equipment. Until these synthetic products have reached the production stage, stockpiling of their counterparts is the only sure method of meeting potential military requirements.

Subcommittees have been formed to develop the maximum amount of information on specific materials. The graphite subcommittee is working on development of a specification which would permit the best quality of graphite to enter the stockpile, while at the same time not to be too restrictive on the supplier or ore producer.

Similarly, the subcommittee concerned with industrial diamonds has reviewed specifications and recommended revisions that were incorporated into the current purchase specification. Industrial diamond consumption was 12,500,000 carats during 1944, a great increase over the 2,000,000 carats consumed per year in the prewar period. Approximately 90 percent of the world's supply are obtained in Africa, of which the Belgian Congo produces about 75 percent. Brazil and other sources produce the remaining 10 percent.

On the question of quartz crystals the subcommittee reviewed a proposed revision in purchase specification for this material. The United States depends entirely upon Brazil for its supply.

The type of corundum being stockpiled comes entirely from the Union of South Africa. No new commercial sources have been developed since World War II. This vital material is essential in powdered form for the production of accurate optical lenses.

The subcommittee on asbestos is currently reviewing a specification which has been developed for the purchase of crocidolite, a grade of asbestos recently added to the list of strategic and critical materials.

Recommendations formulated by the several subcommittees will be studied by all members of the main committee and, after concurrence, are forwarded to the Munitions Board for final action. Although advisory in character, these recommendations provide the Munitions Board with the viewpoint of industry to aid them in planning objectives to complement the changing pattern of industrial production.

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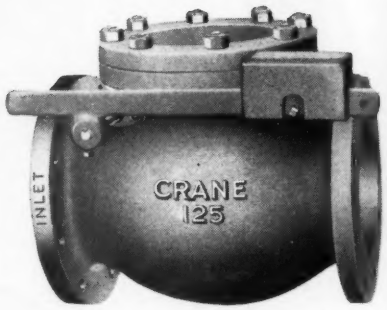

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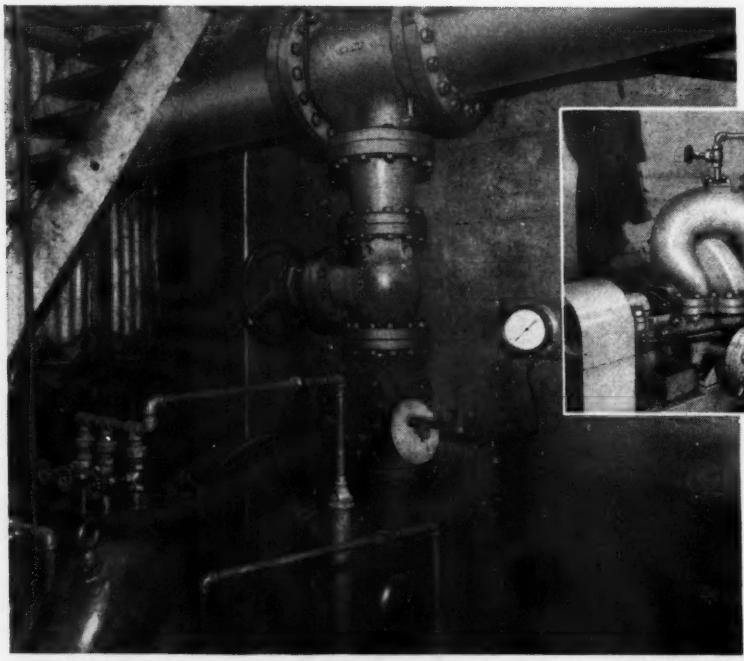

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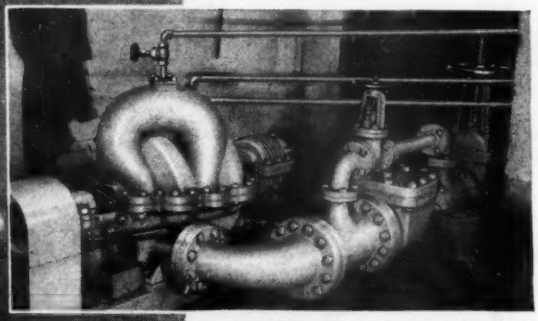

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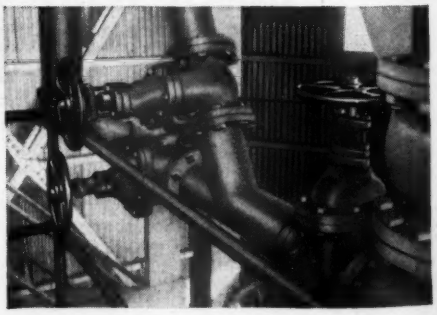
SETTLING CONE *in coal preparation plant showing Crane 125-pound iron body wedge gate valves with non-rising stem.*



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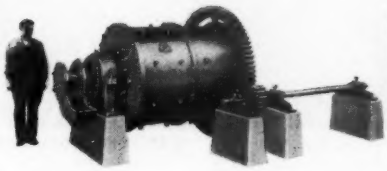
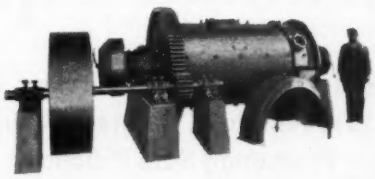
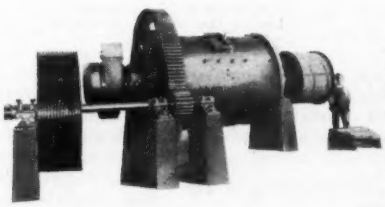
Tonnage to be treated is only one factor in determining correct size and type of ball mill. Hardness, mineral structure, and treatment time must also be considered. Grinding tests will be made without charge by Denver Equipment, Ore Testing Division, to help you select the right ball mill to do the best job for you. Write today for more information and directions for sending sample to be tested.



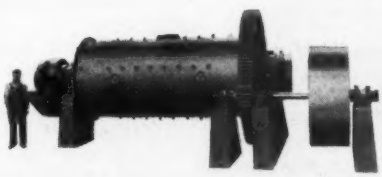
3'x3' Denver Steel-Head Ball Mill arranged for mule back transportation or for adding extra shell sections. Heavy trunnions and bearings allow for adding extra sections.



4'x8' Denver Steel-Head Ball Mill with peripheral discharge for dry grinding. Drum or scoop feed may be used as well as a variety of trunnion type discharges.



6'x8' Denver Steel-Head Ball Mill equipped with trommel screen on discharge. Heads may be welded or bolted to shell sections.



5'x12' Denver Steel-Head Ball-Rod Mill. Heavy trunnion bearings, cast integral with heads, give adequate support to this large mill.

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DENVER EQUIPMENT COMPANY, 1406 17th St., Denver 17, Colorado

Safe installations require safety-minded workers

The Human Equation in Safety

Personal Contact Between Supervisor and Employe Stimulates Interest and Fosters Cooperation in Promoting Safe Practices

By C. R. STAHL

Assistant to Vice-president,
Eastern Gas & Fuel Associates

IT has been aptly said that every effective industrial safety program is reared on the same four foundation blocks:

(1) The unqualified backing of top management
(2) A plant kept in the safest practicable condition
(3) Safe working practices backed by logical working rules
(4) Employe cooperation

Every man responsible for the success of a safety program wants and requires stout footing for his support. As Kipling's King Henry says of his chair of state:

"I won't trust one leg, nor two, nor three,
To carry my weight when I sets me down,
I wants all four of 'm under me—"

Although each of these four requirements is essential to the full success of a safety program they are self-evidently not of equal weight. Points three and four are certainly more important than the others. These are the points we are dealing with now. It will be found that the mines that come up again and again with commendable safety records, do so because they know the immense value of securing the cooperation of their employes.

This may seem elementary but it was not always so. Turn over the pages of the old mining magazines of 35 and 40 years ago and you will find that one of the dominant ideas of those days was the conviction that the rank and file miner was too ignorant to work safely and too foolhardy to want to. It was thought that since it was impossible, due to the nature of the brute, to teach the miner safe working habits, the best that could be done was to encourage the formation of first aid and rescue teams, so as to be able to at least pick up the pieces after the presumably inevitable had happened. We know better now, though the old philosophy still crops up now and then in an attenuated form among some of the more cynical members of our fraternity after an encounter with some hard-headed individual at the face.

Safety engineers will be the first to acknowledge that foremen are indispensable agents in any safety program. This is because foremen are the only representatives of the company who come into close and constant contact with the great body of workmen whose cooperation is vital to the effectiveness of that program. Thus, through this constant contact, the foreman can be either a highly efficient transmission belt for safety principles and practices or an equally effective dam against their propagation. There is no need to labor the point that on the operating level he is at once the best salesman and the most vigilant watchman for safety that we have.

That being so, and assuming that our foremen have been properly sold on safety themselves, let us go on to something equally important—how to gain through these foremen the confidence and cooperation of the men.

No foreman can long secure cooper-

ation from his men unless he has an honest interest in his workmen. However, a sincere desire on the part of the foreman is not enough. He must either know or be trained how to pull, and not push; to encourage, not threaten; to lead and not drive. All too few supervisors know these techniques, therefore they should be trained. Labor unions know how to train men in these techniques. Why should not management be equally alert to the necessity and develop the techniques essential to a sound training program.

Employe Cooperation—Essential Ingredient

Next, what is employe cooperation, and how shall we attain it?

Two mastiffs can harass a lion and three can kill him, said the ancients. This was one type of cooperation. Old plainsmen say that a coyote, working alone, cannot catch a jack rabbit, but two, working together, can.

Desirable as cooperation is, it is no simple matter to implant a cooperative spirit among a group of men. It is a complicated problem in human relations, in which we have as many variables as we have members of the group. All of the variables must be evaluated and equated with some approach to accuracy if we are to obtain successful results. Our hypothesis is as it concerns the individual: All men are not alike but instead all men are different. Any group of men is the composite result of many mental and physical factors—nationality, education, family life, health, physical ability, mental quickness, age, disposition, past experience and many more. If the boss handles five men, or ten men, or a hundred men, the problem is still that of dealing with men who are not all alike but are all different.

Granted that in dealing with the individual, different methods of approach have to be used for different individuals, there are ways of securing cooperation by methods or procedures which affect the group as a whole. Great characters in history knew this. An illustration lies in the fact that the soldiers of Napoleon were intensely loyal because he often took advantage of this trait of human nature. Through his military secretary he would inquire of a troop commander if there were among his men any who had served in the old army of Italy. If there were he took careful note of their names and before his next review of that regiment he would have them pointed out to him. Striding along before the ranks he would suddenly halt before some flabbergasted old soldier. "Are you not Jean Duval of the regiment of Lyons?" The weather-beaten veteran would admit diffidently that he was. "And did I not see you when we beat the Austrians at Marengo?" Jean Duval could hardly deny that it might have happened. Then after extolling him proudly as an "old mustache" and a hero of the campaign of 1800, the Emperor would pin upon him then and there the Cross of the Legion of Honor, a supply of which he always carried with him on such occasions.

Talking things over at the Midvale mine

You may laugh at that performance, but it got results. A dozen or so of such performances and you see manufactured a legend—the legend that the Emperor never forgot his old soldiers. So simple are the means by which dynasties are founded. But it was not only by such tactics that Napoleon was able to gain the undying loyalty of his soldiers. His first act when he went to Italy to head the dispirited army opposing the Austrians was to make a speech to his soldiers. Throughout his career his leadership through the spoken and written word enabled him to bring into play his military ability and overrun the greater part of Europe.

Referring to the question of what can be done by the use of policies that appeal to the group, and which have no direct relation to discipline, as such, a few examples might be cited. One illustration lies in the administration of the old-style burial fund. Seldom indeed was there a man who would not willingly subscribe to such a fund.

A more recent illustration is shown by the example of one mine which, by cooperation between hospital, doctor, Red Cross, company management, and employe cooperation, instituted a plan of blood typing for every man on the payroll. The advantages were so obvious, when explained to the men, that 100 percent cooperation was obtained. The experience with this blood typing has been such that all the men at the mine are thoroughly sold on it. The next step will probably be to have the blood banks kept at the mine, as well as the hospital, so that blood transfusions for shock can be given immediately after an injured man is brought from the mine.

Another illustration of such cooperation lies in the fact that a few mines have accomplished the result of having every employe connected with the production of coal, officials and workmen alike, to take the 40-hour course in mine safety taught by the safety engineers of the U. S. Bureau of Mines.

Man-to-Man Equation

Although action appealing to the group is essential, the personal man-to-man equation is equally important. One step in this connection is to avoid the detestable American habit of addressing everyone as "Mack" or "Joe." On the other hand, there is hardly any more effective means of promoting good will between a foreman and his men than to greet them individually by name. If he knows their nicknames, so much the better. A man's name is what distinguishes him from his fellows and it is only human for him to appreciate being singled out personally by means of it.

Nothing sours a supervisor's relations with his men more surely than a show of favoritism. Reward for merit is deserved. But more reward to one man than to another, for equal merit, stirs dissension and makes bad feeling. Likewise, to penalize one man, although another guilty of the same offense is excused, will break down all discipline. A supervisor loses the respect of his men if he is not consistent in his dealings. Overfamiliarity with some and personal coldness to others is another factor which breeds factionalism and destroys teamwork.

Accident prevention, through proper application of a knowledge of the human equation, is hardly a program which can be applied; rather it has to be lived. Untiring and continuous effort is a necessity.

These foremen secure cooperation through sincere interest in their men

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worn teeth

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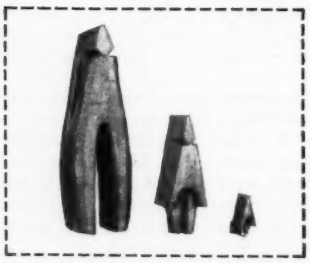

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Wheels of GOVERNMENT

AMC

As Viewed by A. W. DICKINSON of the American Mining Congress

AT the present stage of this campaign-year Congressional session, the House of Representatives, after a leisurely spent vacation, is moving along comfortably in its consideration of the $29-billion "single package" appropriations bill, while the Ways and Means Committee is preparing the excise tax cut measure for report to the House floor some time the latter part of this month. The Senate, however, has a heavily crowded calendar and must still dispose of Social Security revision, the appropriations bill, the tax measure and much more. Adjournment by mid-July would be almost a miracle, but that is what some of the leaders still hope to accomplish.

Taxation

Although the Committee on Ways and Means and the Staff of the Joint Committee on Internal Revenue Taxation are still working on the drafting of the Revenue Bill of 1950, there seems to be general understanding that no changes are to be made in the present percentage depletion allowances for metals and minerals or oil and gas. The Committee has tentatively approved reductions in wartime excise taxes totalling $967,000,000, exceeding the White House recommendations by $312,000,000. This action may increase the pressure to raise corporate income tax rates and apply a ten percent withholding tax to corporation dividends. One member of the Committee is advocating an excess profits tax to produce revenues of around a billion dollars annually.

Among the excise tax reductions on which tentative agreement has been reached are: a cut in the tax on transportation of freight from three percent to one and one-half percent; reduction on transport of coal from 4¢ to 2¢ per ton; on transportation of persons, from 15 to 10 percent; on long-distance telephone messages, from 25 to 20 percent.

The bill is expected to reach the House floor the latter part of May.

Social Security

The determined drive of the mining witnesses before the Senate Finance Committee on March 9 was justified by the Committee's April 24 announcement, that the current law's definition of the term "employe" will be retained. Chairman George stated that, "In general, persons who would be covered as employes by the definition in H. R. 6000 would be covered, under the Committee's action, as self-employed individuals."

This action in the bill, soon to be reported to the Senate floor, maintains mining lessees, contract loggers, and door-to-door salesmen in their present status as independent contractors.

The Committee has voted to freeze the present one and one-half percent payroll tax until 1956 and to retain the present $3000 taxable wage base. The House version of H. R. 6000 would increase the rate to two percent January 1, 1951 and increase the base to $3600.

Petroleum Imports

Heavily increasing imports of foreign petroleum have resulted in a determined effort to place an import tax of $1.05 per barrel in the tax bill now before the Committee on Ways and Means. Oil importations in 1949 were at the rate of 234,000,000 bbl—a 70 percent growth since 1946. One-third of this was residual fuel oil, which is burned under boilers—and nearly all of the remainder was crude giving a relatively high yield of residual. Joining in the effort to enact the import tax are coal and independent oil producers, railroads and representatives of mine and railroad labor.

A House Education and Labor Subcommittee has opened hearings to demonstrate the damage that foreign oil imports are doing to American industry. Headed by Chairman Steed (Dem., Okla.), the committee includes Reps. Bailey (Dem., W. Va.), Burke (Dem., Ohio), McConnell (Rep., Pa.), and Smith (Rep., Kans.).

Speaking before the 1950 Coal Convention of the American Mining Congress at Cincinnati April 26, Walter F. Schulten, Pittsburgh Consolidation Coal Co., warned of the danger of foreign oil imports, declaring, "Unless the critical dilemma we face is solved, America's basic industries of coal, petroleum and railroads will not be able to properly serve the public in the years ahead. These industries deserve an opportunity to operate with maximum efficiency. Congress could give them the green light they need by reducing foreign oil imports to a point where imports would supplement, rather than displace, American fuel capacity."

Trade Agreements

The State Department has announced that negotiations will begin at Torquay, England, on September 28 for possible reductions in duties on 2500 commodities. Public hearings on the commodities to be considered for tariff concessions will begin before the Committee for Reciprocity

Washington Highlights

CONGRESS: Work jams Senate.
TAX: House to get bill in mid-May.
SOCIAL SECURITY: Committee continues mine lessee status.
OIL IMPORTS: Tax of $1.05 per barrel sought.
TRADE AGREEMENTS: Threaten industry.
COPPER: Administration would continue duty suspension.
STOCKPILING: Armed Services committees investigate.
INCENTIVE PAYMENTS: New bill pressed.
PLAN NO. 12: Would put General Counsel under NLRB.
ST. LAWRENCE: Again active.

Information on May 24, and applications to be heard must be made before May 10; closing date for submission of briefs is May 17.

Included in the State Department list of commodities subject to negotiations for reduction in duties are: cobalt, oxides and salts; lamp black; lead pigments; zinc chloride, sulphate and sulphide; magnesite and periclase; gypsum; clays or earths, including bentonite, china clay and kaolin; crude feldspar; mica; talc; steatite or soapstone; bismuth; German silver or nickel silver; nickel and alloys; lead-bearing ores, lead bullion, lead in pigs and bars, dross, reclaimed scrap lead, and type and Babbitt metal; zinc ores and slab zinc; ferromanganese, ferromolybdenum, ferrosilicon, chrome metal and alloys; barium, boron, calcium, strontium, titanium, uranium, vanadium, zirconium, ferrotitanium; and a long list of iron and steel products.

Meanwhile the State Department and allied free trade advocates are making a strong drive before the House Foreign Affairs Committee for congressional approval of the International Trade Organization. The charter of this organization would impose obligations on the United States that are clearly beyond our economic need and financial capacity to fulfill. The National Foreign Trade Council and other domestic industry organizations have voiced vigorous opposition to the ITO and its charter.

Copper Import Duty

Although the State, Treasury, Commerce and Interior Departments have reported to the House Committee on Ways and Means, endorsing extension of the copper import tax, the Committee has given no further indication as to when it may hold hearings on the subject. The pending bill by Rep. Patterson (Rep., Conn.) would continue suspension to June 30, 1952.

The Munitions Board has advised the Committee that since stockpile objectives would not be affected by Congressional action on the copper import tax, the Board will leave it to other Government agencies to advise Congress as to the desirability of the Patterson bill. The President of Chile, while in the United States recently, urged continuation of the suspension, declaring that the 2¢ import tax would do "severe damage."

An interesting sidelight on the protective tariff situation is found in the applications filed by both the Reynolds Metals Co. and the Kaiser Aluminum and Chemical Corp. with the U. S. Tariff Commission under the "escape clause" in the Foreign Trade Agreements Act. These companies have requested the Commission to make an investigation to determine whether or not the aluminum industry has suffered serious injury as a result of foreign trade agreements. Likewise the Lead Industries Association has determined to seek relief under this clause, inasmuch as heavy imports of low cost foreign lead from devalued currency countries have caused the shutting down of mines.

Stockpiling

Stockpiling appropriations for the fiscal year 1951 totaled $633,608,240 for cash expenditure, with $100,000,000 additional in contract authorizations. This represents an increase of $108,000,000 over appropriations for the fiscal year 1950 for the stockpiling of strategic and critical materials.

Chairman Hunt (Dem., Wyo.), of the Senate Armed Services subcommittee investigating the defense stockpiling program, has stated that the U. S. Bureau of Mines is drafting a bill which would encourage domestic production of manganese. A House Armed Services subcommittee under Rep. Durham (Dem., N. C.) is planning an investigation to ascertain if the Munitions Board has authority to keep in operation domestic mines producing strategic and critical metals and minerals. This subcommittee includes: Reps. Hardy (Dem., Va.), deGraffenried (Dem., Ala.), Walsh (Dem., Ind.), Short (Rep., Mo.), Anderson (Rep., Calif.), Johnston (Rep., Calif.), and Patterson (Rep., Conn.).

Incentive Payments

A revised incentive payments bill introduced by Rep. Clair Engle (Dem., Calif.) has been reported to the House by the Public Lands Committee and is now before the Committee on Rules. Six other members of the House have introduced the same bill.

Essentially the same as the O'Mahoney bill, S. 2105, which was rejected by the House March 16 by a vote of 166 to 144, the pending measure differs in that it (1) provides for an appropriation of $60,000,000 for the first fiscal year 1951, and $90,000,000 for each year thereafter for conservation and exploration payments, whereas S. 2105 authorized $80,000,000 per year; (2) authorizes additional contractual authority each year in excess of appropriations where necessary to continue exploration and mining operations (no such provision was contained in S. 2105); (3) eliminates the Minerals Conservation Board, which was to administer S. 2105, and places the administration of the Act directly in the hands of the Secretary of Interior, with the advice of other Cabinet officers; (4) makes the program effective for four years.

Plan No. 12

There is determined opposition in both houses to the President's Reorganization Plan No. 12 which would abolish the independent status of the National Labor Relations Board General Counsel and transfer his functions to the Board itself. The General Counsel's office was set up with an independent status by the Taft-Hartley Act with the definite purpose of maintaining a separation of the prosecuting and judicial functions of the NLRB.

In the Senate the Committee on Expenditures in the Executive Departments has reported favorably the Taft resolution which, if adopted, will prevent Reorganization Plan No. 12 from becoming effective. The Committee vote was 9 to 4. The Committee report stated, "We believe that the adoption of Plan No. 12 and the resultant return to the Board of the dual functions of prosecutor and judge would destroy the public confidence which the BOARD has gained under the Taft-Hartley Act. We believe this would be true no matter how fair-minded the Board might be in the conduct of its affairs, because the Board performs its functions in a atmosphere charged with emotion, determining issues between parties hotly contesting their rights and quick to claim bias on the mere suspicion that such exists. The return of the prosecuting function would be an insurmountable handicap to maintenance of the confidence of the litigants and the public."

In the House the Committee on Expenditures disapproved the Hoffman (Rep. Mich.) resolution offered in opposition to Reorganization Plan No. 12. This action was taken on a party line vote of 18 to 7.

As yet no vote has been taken on either the House or Senate floors, but unless Plan No. 12 is disapproved by either the House or the Senate before May 24, it will become effective.

St. Lawrence Project

Although the Senate is not expected to act on the resolution authorizing construction of the Great Lakes-St. Lawrence Seaway and Power Project at this session, spirited testimony has been presented on the resolution before the House Public Works Committee. A string of Commerce, State and Army witnesses has appeared in behalf of the project and president George M. Humphrey of the M. A. Hanna Co. told the committee that construction of the seaway would make at least 350,000,000 tons of high grade Labrador iron ore available to the Great Lakes steel industry. Republic Steel Corp.'s Norman W. Foy testified that the project is vital to national defense and industrial development, that it should be constructed on a self-liquidating basis and be paid for by a fair toll charge on each ton of cargo.

No further action is anticipated by the House committee in the present session, unless the Senate acts.

AMC Personals

James K. Richardson, manager of the Utah Mining Association for the past four years, has been appointed industrial engineer for the western operating divisions of Kennecott Copper Corp., effective May 1.

Following graduation from the Missouri School of Mines in 1932, Mr. Richardson served as a miner, mucker, timberman and diamond driller with a number of western mining operations. In 1932 he became mining and chemical engineer for the U. S. Potash Co. at Carlsbad, N. M., and in 1936 was appointed director of safety and industrial hygiene for the Climax Molybdenum Co. In 1942 he was appointed secretary of the Tri-State Zinc and Lead Ore Producers Association and later entered the U. S. Army. Following World War II he joined the Utah Mining Association as assistant manager and in July 1946 was appointed association manager.

T. L. Kemp, Jr., has been transferred to No. 15 mine of the West Virginia Coal & Coke Corp., where he is serving in the capacity of assistant superintendent.

Robert M. Hernon is now chief of party for the metalliferous work being conducted by the U. S. Geological Survey in the Silver City, N. M., area.

Parke A. Hodges was recently elected vice-president of Behre Dolbear & Co., consulting mining engineers and geologists of New York City.

Dooley P. Wheeler, Jr. is now in charge of exploration in the western United States for the American Metal Co. of Colorado, with offices at 308 Judge Bldg., Salt Lake City. Mr. Wheeler succeeds **Fred H. Stewart** who has been transferred to Carlsbad, N. M., as general superintendent of Southwest Potash Corp., a subsidiary of the American Metal Co., Ltd.

Victor Bongard has been appointed mine superintendent and **W. Aubrey Smith** has been named mill superintendent of the potash unit.

Arthur B. Lawrence and **James Ellwood Jones, Jr.**, were recently elected to the board of directors of the Pocahontas Fuel Co., Inc., when the stockholders authorized an increase in the board from seven to nine members. Officers reelected include **Joseph H. Bowen**, chairman of the board; **Hugh R. Hawthorne**, president; and **Paul W. Jenkins**, assistant to the president. **A. L. Hopkins**, was elected assistant treasurer.

Carl Zapffe retired on May 1 after service with the Northern Pacific Railway Co. since 1906. Until 1925 he was geologist for the railroad and then became manager of iron ore properties. Mr. Zapffe will maintain an active interest in the development of mineral deposits. He may be reached at 325 Bluff Ave., Brainerd, Minn.

Dr. Hamnett P. Munger has joined the staff of Battelle Memorial Institute to coordinate its air-pollution research activities and to act in a liaison capacity between Battelle and industry.

Roy H. Kingsbury has been reelected president of Metropolitan Mines Corp., Kellogg, Idaho.

Otis H. Taylor, formerly with the engineering department of the Bell & Zoller Coal and Mining Co., has resigned to join the staff of the Goodyear Tire & Rubber Co. as a sales engineer.

George M. Brown is now general superintendent of Manganese, Inc., at Henderson, Nev. He was formerly with the Tungsten Mining Corp., Henderson, N. C.

Cadwallader Evans, Jr., has announced the opening of an office for consulting work, specializing in the mining and preparation of anthracite.

Rolin J. Kennard has been appointed chief engineer of the electrical and mechanical department of the Anaconda Copper Mining Co. He succeeds the late C. D. Woodward.

Carl Dann, formerly an official at No. 155 mine, Consolidation Coal Co. (Ky.), has been named superintendent of the Winters mine at Farraday, Ky.

Edward G. Gersich has been appointed district safety supervisor, Canisteo district of the Oliver Iron Mining Co. on the Mesabi iron range. He succeeds **R. S. Barrett**, resigned. **Gerald J. Kaiser** has been appointed safety inspector in the Hibbing-Chisholm district replacing Mr. Gersich.

Class A directors of Bituminous Coal Research, Inc., who have been appointed to serve for another two-year term are **Edwin H. Davis**, president, New York Coal Co.; **A. B. Foulger**, vice-president, Lion Coal Corp.; **H. A. Glover**, president, Island Creek Coal Sales Co.; **D. E. Griffith**, president and general manager, Pruden Coal & Coke Co.; **Ralph E. Jamison, Jr.**, sales manager, Jamison Coal and Coke Co.; **S. S. Nicholls**, vice-president, C. H. Sprague & Son Co.; **C. J. Potter**, president, Rochester and Pittsburgh Coal Co., and **R. H. Sherwood**, president, Central Indiana Coal Co.

Class B directors who will serve the second year of a two-year term are: **George Dunglinson, Jr.**, executive vice-president, Norfolk and Western Railway Co.; **B. R. Gebhart**, vice-president, Chicago, Wilmington & Franklin Coal Co.; **J. B. Morrow**, first vice-president, Pittsburgh Consolidation Coal Co.; **M. L. Patton**, vice-president, Truax-Traer Coal Co.; **P. B. C. Smith**, president, Southern Coal Co.; **R. D. Stockdale**, president, Red Jacket Coal Sales Co., and **D. A. Thomas**, president, Boothton Coal Mining Co.

Charles N. Bailey has been appointed chief engineer for the Oliver Iron Mining Co., succeeding **Ford E. Boyd**, retired. Until joining the Oliver staff last September, Mr. Bailey was assistant chief engineer of the International Minerals and Chemical Corp.

Dr. Esper S. Larsen, III, has been appointed assistant chief geologist of the U. S. Bureau of Mines succeeding **Dr. Harry S. Ladd**, who has been assigned to research work.

Weirton Coal Co. and National Mines Corp., operating in western Pennsylvania and northern West Virginia, announced the appointment on April 1 of **C. W. Thompson** as manager of both companies. The operating office is at Isabella, Pa.

Albert T. Koenen, previously superintendent of the Trout Lake concentrator of the Oliver Iron Mining Co., has been appointed supervisor of beneficiation. **W. P. Morris** has been appointed assistant supervisior of beneficiation and **K. F. MacAlpine** has been named superintendent of the washing plants at Trout Lake.

Harry L. Washburn, a senior from the University of Kentucky, was recently named by the Old Timers Club, as the engineering student "most likely to succeed in the coal industry." At a recent meeting of the club, Samuel M. Cassidy, president, Consolidation Coal Co. (Ky.), presented Mr. Washburn with an engraved watch.

Leon E. Battles has been promoted chief engineer of the Canisteo district iron mining operations of the Oliver Iron Mining Co. He succeeds the late R. P. Weidenfeller. **Robert L. Johnson** has been appointed assistant mining captain of the Fraser underground mine. **David H. Hill** has been named assistant chief mining engineer at Coleraine, Minn. **Wayne W. Bebe** has been appointed general pit foreman at the company's Arcturus and Gross-Marble mines.

At a recent directors meeting of the New Jersey Zinc Co. **R. L. McCann** was elected a vice-president of the company. He formerly served as assistant to the president. He is responsible for the production of raw materials and finished products from the company's operations.

Robert F. Duemler, vice-president, Delaware, Lackawanna & Western Coal Co., has resigned to join W. R. Grace & Co. in an executive capacity. **John J. Shipherd** succeeds Mr. Duemler as vice-president of the coal company.

Thomas Lyon, assistant to the general manager, International Smelting and Refining Co. retired recently. He had been connected with the firm for 28 years, starting with them in 1922 as a geologist. He was made chief geologist in 1927, serving in that capacity until 1944 when he moved up to his present position.

Paul R. Paulick, together with several other engineers, has formed P. R. Paulick and Associates, consulting mining engineers, at Library, Pa.

B. D. Stewart, for 30 years Territorial Commissioner of Mines in Alaska, has retired. Before going to Alaska in 1910 with the Alaska-Treadwell Gold Mining Co., Mr. Stewart had worked for eight years in Idaho mines.

General Brehon Somervell, president, Koppers Co., Inc., has been named chairman of the company's board of directors. His election came at the retirement of **J. P. Williams, Jr. W. F. Munnikhuysen,** formerly vice-president and general manager of the company's wood preserving division, was made executive vice-president of the company.

Walter J. Dezell, formerly a foreman on the Kelley shaft at Butte, Mont., has gone to Conda, Idaho, with the fertilizer department of the Anaconda Copper Mining Co.

Harold D. Wright, formerly president, has been elected chairman of the board of the Republic Coal & Coke Co. **George J. Leahy,** who has been named executive vice-president, succeeds Mr. Wright as president of the company.

R. O. Buck has been appointed chief engineer of the M. A. Hanna Co. succeeding **R. H. Bassett,** retired.

E. G. Gnaedinger, mine manager, Silver Dollar Mining Co., retired on May 1 but will continue to serve as a consultant to the company. **Robert R. Weideman,** now serving as assistant to the general manager, will succeed Mr. Gnaedinger.

D. A. Rhoades, vice-president and general manager, Kaiser Aluminum & Chemical Corp. of San Francisco, has been appointed a member of the National Minerals Advisory Council.

Walter M. Horne, assistant manager of the Utah Mining Association for the past 18 months, has been named acting manager.

C. J. Parkinson is now vice-president and director of Dragon Consolidated Mining Co., Tintic, Utah, an affiliate of Anaconda Copper Mining Co. and North Lily Mining Co.

—*Obituaries*—

J. R. Blackburn, widely known Minnesota representative of the Euclid Road Machinery Co., died on March 25.

Allan J. Clark, former chief metallurgist for the Homestake Mining Co., died recently in Spearfish Valley, S. D. He had retired in 1942 because of ill health. A graduate of Columbia School of Mines, he worked for the Tennessee Coal, Iron & Railroad Co. before joining Homestake as assayer and chemist. In 1907 he became chief metallurgist.

C. R. Coleman, 87, pioneer coal mine operator and owner of extensive coal lands in Kentucky, died at Pineville, Ky., on February 24. Mr. Coleman was president and general manager of the Coleman Fuel Co., which he formed in 1933. He operated the Lexington & Carter County Coal Co. mines and the Coleman Mining Co.

Charles W. Davis, 59, died on February 21 in Boulder City, Nev. He had been with the U. S. Bureau of Mines for 34 years and since April 1945 was chief of the Boulder City branch of the Bureau's metallurgical division.

Grant H. Dowell, 82, retired general manager of Phelps Dodge Corp.'s Copper Queen Branch at Bisbee, Ariz., died March 29 at his home in San Marino, Calif. He originally entered the mining field in El Paso as secretary to the general manager of the smelter there. Later he became metallurgical accountant and ore buyer for the Copper Queen Consolidated Mining Co. at Bisbee, and subsequently served as superintendent of the Old Dominion Copper Co. at Globe. He then became assistant general manager and later general manager of the Copper Queen and retired in 1927.

Richard J. Evens, 52, general superintendent of milling operations in Utah and Nevada for Combined Metals Reduction Co. died recently in Tooele, Utah. He had been flotation superintendent and mill superintendent from 1925 to 1948.

Palmer S. Gray, 57, superintendent of operation of Pickands Mather & Co. on the Cuyuna Range, died on March 21.

H. H. Pratt, for many years chief mechanical engineer for Phelps Dodge Corp., died at Douglas, Ariz., on March 11. He retired from active work in 1936.

John P. Reese, chief coal inspector of the Hudson Coal Co., died on February 13. He had completed 61 years of continuous employment by the company, during which he progressed to the post he held at the time of his death.

Richard Alexander Wagstaff, 62, widely known Utah metallurgical engineer, died March 8 in Salt Lake City. The author of books on mining and metallurgy, he entered the Utah mining field in 1911 when he did experimental work on flotation ore for the Utah Copper Co. He was in charge of the crushing department of the Butte and Duluth Mining Co. in 1913 and 1914. Later he was assistant superintendent in charge of sampling, roasting, smelting and converting at the American Smelting & Refining Co. plant in Garfield, Utah. He was later general manager and vice-president of all western departments of the company until 1948. He was also consultant to Nevada Consolidated Copper Co. and Phelps-Dodge Corp. He invented the C-W roaster and the Wagstaff gunfeed for reverberatory furnaces.

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The C-M-I Centrifugal Dryer is the efficient, profitable and economical answer to all of your dewatering problems.

Reduces Water Content. The C-M-I Dryer reduces the surface moisture of newly washed coal. It takes off the greatest volume of water thereby reducing the cost of heat drying, the more expensive method.

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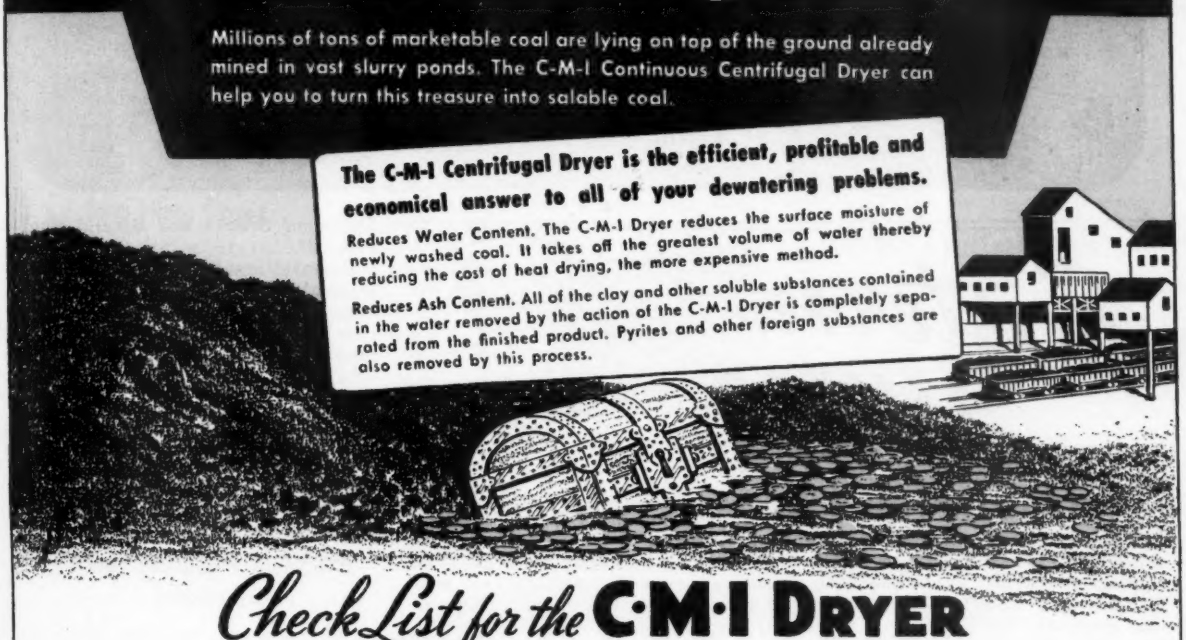

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Efficient—The C-M-I Dryer will reduce the water content of 28 tons of slurry from 82% to 7½% in less than one hour!	YES ✓	NO
Profitable—Figures submitted by operators using the C-M-I Dryer show that in slurry salvage alone, the extra profits will pay for the equipment in a few months time.	YES ✓	NO
Capacity—The large C-M-I Dryer will handle as much as 75 tons of ⅜" x 28 mesh coal per hour, reducing the water content from 25% of surface moisture to 6% or less.	YES ✓	NO
Durable—All parts are made of the best metals obtainable. Revolving parts are dynamically balanced on the latest type of balancing machine.	YES ✓	NO
Economical—In many instances, the C-M-I Dryer eliminates costly heat drying normally required.	YES ✓	NO

C·M·I CENTRIFUGAL DRYER

If you are interested in how your dewatering problems may be solved with a C-M-I Dryer, write to us, stating the sizing of the coal, such as the percentage on 8 mesh, 10 mesh, 20 mesh, 35 mesh, 65 mesh and 100 mesh standard Tyler screens, and also the amount passing through 100 mesh. We will make our recommendation at no cost to you.

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146 PRESIDENT STREET ST. LOUIS 18, MO.

New Jersey Zinc Progress

In its annual report, the New Jersey Zinc Co. states that "progress in sinking the shaft at Freidensville, Pa., has been materially retarded by the necessity for controlling large flows of water in the upper levels. The bottom of the shaft is now in solid rock and recent progress has been satisfactory." Looking to the future the report goes on to say "There is reason to hope that major water difficulties are now behind us and we estimate that production may still be expected by 1952 as previously reported."

A new shaft is also being sunk at the Ogdensburg, N. J. mine and the annual report states that the installation is progressing satisfactorily. Improvements to the main shaft at Austinville, Va., are about complete; additional equipment is to be provided and further development work undertaken before production is increased.

Bureau of Mines Activities Described

In the annual report of the U. S. Bureau of Mines, James Boyd, director, cited the many activities of the Bureau and the progress made in special fields. An outstanding highlight of the report was the reduction of coal-mine fatality rates to a low of 1.21 per million tons of coal produced in the first six months of 1949. The new roof bolting method of roof control was reported to be widely used throughout the nation as the result of research and testing by private industry and the Bureau. Progress was reported in other phases of coal research, petroleum research, fuel savings, mineral investigations, metallurgical research, accident prevention and first aid, safety recommendations and in the economical and statistical services of the Bureau.

Full mechanization of the Rifle, Colo., oil shale project is reported to have reduced the cost of mining oil shale to a point that makes possible the economic use of vast resources of this oil-bearing rock. The synthetic fuels demonstration plant at Louisiana, Mo., has shown that liquid fuel can be produced from coal at high efficiency, although more expensively than from natural petroleum.

Experimental mining studies were conducted at Mount Weather, Va., in the Montana chromite district, on a vanadiferous phosphate deposit in Idaho and on an eastern pegmatite deposit. New studies were conducted on the application of physics to mining, and progress was made in solving the fundamental problems of generation and preparation of strain waves and breaking rock by explosives.

Research Opportunities

One fellowship and several research assistantships for gradual study in mineral engineering are being offered by the department of metallury of the Massachusetts Institute of Technology. Appointment to these positions are designed to facilitate studies for the degrees of Master of Science, Doctor of Science and Mineral Engineer.

Research associateships for study in mineral engineering are available for men who have had advanced experience using radioactive tracers. This program is sponsored by Armour and Company and by the Atomic Energy Commission.

Applications may be made to A. M. Gaudin, Richards Professor of Mineral Engineering, Massachusetts Institute of Technology, Cambridge 39, Mass.

Phosphate Production Facilities Expanded

Announcement has been made by Louis Ware, president, International Minerals & Chemical Corp., of a $4,000,000 program of expansion and development in the Polk county phosphate fields of Florida. The program includes plans for erection of a new office building as Florida headquarters for the company; plans for construction of a new plant for the manufacture of multiple superphosphate and phosphate chemicals; plans for the construction of a new large sulphuric acid plant; plans for the construction of a new, modern machine shop, warehouse and service center to serve all of the company's Florida operations; and plans for erection of a new phosphate division analytical laboratory.

R & P Closes Mine

Rochester & Pittsburgh Coal Co. has closed its Sagamore, Pa., mine with a capacity of 1500 tons per day. Some 300 men have been laid off. At Yatesboro, Pa., the company will operate its mine on a reduced schedule laying off 200 of its 500 employes.

Charles J. Potter, president of the company, blamed imports of fuel oil for the closing and the curtailment. He said that such closings will continue to occur in the industry due to the importation of oil.

Pond Creek Opening

In April, the Pond Creek Pocahontas Co. went into production with its new mine in the No. 3 Elkhorn seam in Breathitt County, Ky. The property was originally scheduled to start operations on January 1, but the opening of the No. 2 mine was postponed because of construction delays and the miners' strike.

The No. 1 mine was opened on July 1, 1949 and had an output of 289,619 tons for the first six months of operation. For 1950 its estimated production was 700,000 tons. Production for the No. 2 mine is expected to attain an annual rate of 600,000 to 750,000 tons by the end of 1950.

Strip Mines Closed

Three strip mines of the Hanna Coal Co., near Georgetown, Ohio, were closed late in March. James Reilly, vice-president in charge of the company operations, attributed the closure to a lack of orders due to business lost to oil and gas companies during the recent strike. He cited the Dieselization of railroad equipment as a further factor reducing coal demands.

Hendrix Mine Construction

At the Hendrix Mine of the Consolidation Coal Co. (Ky.), the first mine run coal was produced April 22, 1949. Construction of Hendrix' preparation plant has been under way since early in 1949. At this time the plant is already loading washed coal.

Construction is proceeding on the administration building, which includes a bath house, supply house, lamp house, repair shop, first aid room and mine office. This building will be completed this spring.

Improvement Program Nears Completion

With opening of a new preparation plant at its No. 27 mine in Mingo County, W. Va., the Island Creek Coal Co. announced virtual completion of an improvement program begun in 1944, involving a total expenditure of approximately $13,500,000. The new plant is one of five opened in the last 15 months. The five plants have a total daily capacity of 23,500 tons.

Survey Appraises Geological Needs

In the annual report of the U. S. Geological Survey, the nation's future geological needs are appraised. The report states that "Probably most of the deposits that show valuable minerals at the surface have already been discovered." Hope for the future lies, the report adds, in the study of producing districts, in cooperation with operating companies, so as to enlarge known reserves; in intensive study of areas once productive now thought exhausted; and in the extension of study and geologic mapping to regions where indications are favorable but no studies have been made.

Regarding mapping, Dr. William E. Wrather, director of the Survey, stated that topographic mapping was carried on in 44 states, Alaska and Puerto Rico in 1949. Cooperative projects were conducted with 23 states, the Tennessee Valley Authority and Puerto Rico.

Director Wrather pointed to Alaska as still waiting geological exploration work in search for potential deposits of coal, platinum, chrominum and other minerals. He added that only 49 percent of the territory has been geologically mapped by reconnaisance methods, and only a fraction of one percent has been mapped in detail.

The work of the U. S. Geological Survey on water resources was cited as growing in importance as our economy demands increasingly more water.

Clover Splint Completes Safety Training

Recently the Clover Splint mine of Consolidation Coal Co. (Ky.), division of Pittsburgh Consolidation Coal Co., completed satisfactorily the U. S. Bureau of Mines' course in coal mine accident prevention. The mine received training certificate No. 3 indicating that Clover Splint mine is the third in the United States and the first in Kentucky to receive a certificate for having 100 percent of its employes complete the ten-hour training course.

For Sale

Two Type No. 61-CLR Jeffrey loaders, serial No. 27137 and No. 27104; purchased in 1948; in good condition; for operation on 250 volts, direct current; also approx. $4,000 worth of new, unused spare parts for above.

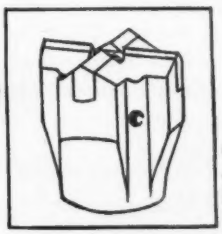
Address all inquiries to Box LC in care of this publication

Shutdown Idles Coal Miners

Early in April a shortage of orders brought the posting of "no work" signs at three Lillybrook Coal Co. mines in the vicinity of Beckley, W. Va. The shutdowns affected operations at the Affinity, Big Stick and Lillybrook mines where normally 1000 men are employed.

According to the Pocahontas Operators Association at Bluefield in southern West Virginia some ten mines are idle in the Pocahontas field with approximately 4000 to 5000 men idle.

Can these two pictures save you money?



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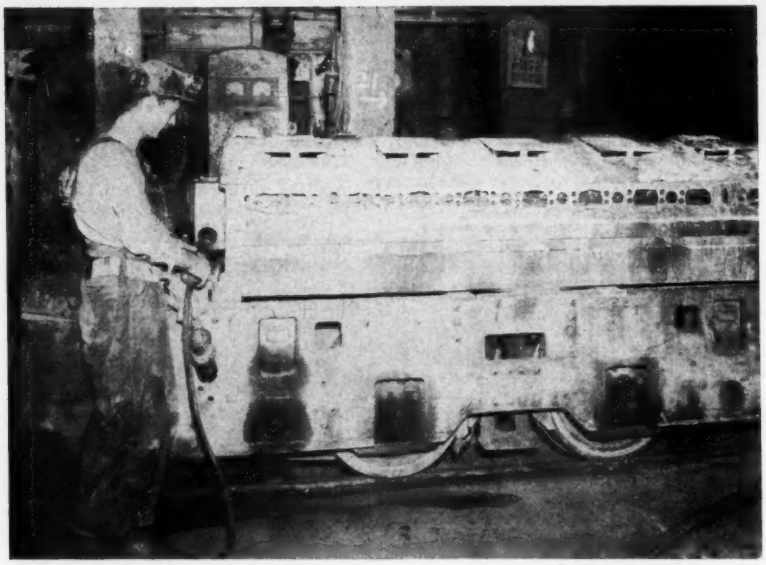

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FREE HAULAGE POWER?

IF THE CURRENT for your locomotives and other haulage equipment is drawn right from the line during costly peak-load periods, you'll be interested in what the mechanical engineer of a big metal-mining company says:

"Our storage-battery locomotives are charged during the graveyard shift and since this is the off-peak power period there is no cost for the energy used; power settlement is made on a peak basis only."

EDISON Nickel-Iron-Alkaline Storage Batteries are ideally suited to such an arrangement because they normally need only six to seven hours of charging. This gives you ample time to inspect and charge them during off-hours. That's because they can be charged at an average of full normal rate without injury. They don't need critical rate adjustments, either, and so can often be charged right from d-c lines.

Edison cells are hard to hurt . . . they're built of steel inside and out . . . and their electrolyte preserves the steel. They can't be injured by standing idle, freezing, accidental short-circuiting or reverse charging. In short, they stay on the job . . . out of the repair shop.

Initially, EDISON batteries cost a little more. But when you rate them in terms of years worked, tons hauled and down-time saved, you'll agree that they're the best investment you can make. Ask any user! Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. In Canada, International Equipment Company, Ltd., Montreal and Toronto.

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Pine Ridge Safety

For its excellent safety record for the fourth quarter of 1949, the Pine Ridge Mine of the Hudson Coal Co., Scranton, Pa., supervised by Ralph W. Smith, mine foreman, has been awarded the safety flag. This mine also won the flag for the third quarter of 1949. The safety flag has been awarded to company mines since 1930.

Buchans Plans New Shaft

A new production shaft is planned by the Buchans Mining Co., Ltd., Buchans, Newfoundland, to reach a depth of 2500 ft. The new shaft is located about three-quarters of a mile from the present operating shaft.

Southern Iron Ores

(*Continued from page* 35)

Flotation does partially take care of one major weakness of straight gravity concentration on these ores, namely the reversed order of mineral gravities for proper classification. The reagentized mineral is propelled by a force other than gravity, though gravity is still the force that pulls the non-floating mineral down. Selective grinding would be a requirement, as in gravity concentration, and the problem of dewatering hematite slime concentrate is unrelieved by the flotation scheme of treatment, no matter which mineral is floated.

Some laboratory work has been done in the froth flotation of silica from ferruginous sandstone. Preliminary results from a far from fully developed technique indicate an 85 percent recovery of iron in the form of a combined flotation concentrate and direct slime averaging 46 percent Fe. Even more attractive results can probably be obtained but costwise it must be remembered that in silica flotation the reagent requirement increases in proportion to the amount of silica to be floated. Thus the lower the iron grade of the ore, the higher the cost of treating it will be.

Electrostatic Separation

It is improbable that electrostatic separation will be applied to Red Mountain ore of any class, although several studies have shown that good separation can be made in the granular sizes, which, however, would be limited in amount. Selective grinding would have to be practiced; the ore would have to be bone dry and the fine dust would have in some way to be recovered and accepted as concentrate without beneficiation. The outlook is discouraging.

Part II will be published in the June issue of MINING CONGRESS JOURNAL.

Lead Industries Convene

On April 13 members of the Lead Industries Association met in Chicago to participate in the two-day annual meeting. Felix E. Wormser, president of the association, and vice-president of the St. Joseph Lead Co. opened the meeting and introduced chairman Clarence Glass, vice-president, Anaconda Sales Co.

Speakers on the panel discussion were W. C. Page, general manager, western operations, United States Smelting Refining & Mining Co.; Paul B. Jessup, vice-president, Day Mines, Inc.; M. A. Wolfkill, manager, Metals Sales Department; and Lloyd Hallam, assistant to the comptroller, Consolidated Mining & Smelting Co. of Canada, Ltd.; Norman Hickman, vice-president, The American Metal Co., Ltd.; and Julian Bers, president, Bers & Co., Inc.

R. L. Wilcox, chief, nonferrous metals branch, Economic Cooperation Administration, presented a paper on "The Current World Lead Situation."

Andrew Fletcher, president, St. Joseph Lead Co., principal speaker at the Thursday luncheon, delivered a paper entitled "Medical and Health Problems of the Lead Industries."

In the afternoon, Simon D. Strauss, vice-president, American Smelting & Refining Co., was chairman of a panel discussion held by lead consumers. Lead and lead product research were discussed at the closing session on Thursday.

Lead mining members met on Friday morning and were followed by a meeting of the metallic lead products division. J. A. Martino, president, National Lead Co., addressed the Friday luncheon group on "Management's New Responsibilities."

The closing sessions on Friday were held by the Red Lead Division.

Federal Company Buys Potter Holdings

Ward C. Ball, district manager, Federal Mining and Smelting Co. recently reported that the holdings of George W. Potter were purchased April 1, with the exception of the Ritz and Lucky Bill properties in Oklahoma. With few exceptions, the transaction included all of the Missouri properties Potter acquired when he purchased the holdings of the Kansas Exploration Co. about six months ago. Included in the purchase was the Snapp mine north of Oronogo, which consists of an 80-acre lease and a 50-ton-per-hour mill, plus other leases and about 400 acres in fee. Also, the Jasper mill with 75-tons-per-hour capacity and the North Side mill with about 50-tons-per-hour capacity were taken over along with a considerable acreage of leased land. The mineral rights to 3400 acres of the Wildwood farm, formerly owned by the Barnsdall Zinc Co., were included. This property includes the old Mattes Brothers mine which was a large producer years ago.

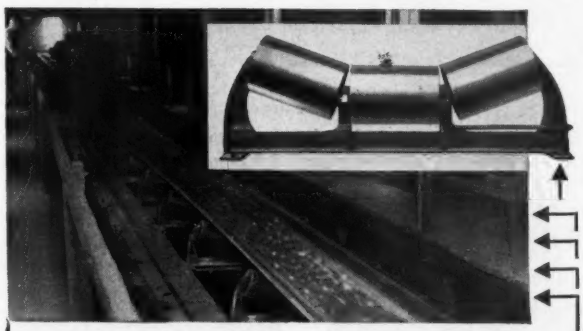
The reason given for selling the property was given by Mr. Potter as his desire to place the holdings in the hands of a company that could undertake appropriate development. Mr. Ball has stated "We will, for the time being, carry on active prospecting operations with a view of eventually developing new and additional ore bodies for mining when prices improve. The full extent of prospecting operations will, of course, depend on the ore discoveries as prospecting progresses."

In addition to its new purchase, the Federal company, with district offices in Baxter Springs, Kan., holds the Lucky Syndicate, Ohimo, Howe and Gordon mines near Picher, Okla. The company also owns the Granby mines which they purchased from the American Zinc, Lead and Smelting Co. several years ago. A large acreage at Duenweg is held where the Federal company operates a mine and mill.

Ice Delayed Lake Shipping

In mid-April upper lake docks required coal and lower lake docks were calling for iron ore but ice has delayed Great Lakes traffic. A report made on April 17 stated that western Lake Superior and Whitefish Bay were both filled with ice 18-20 in. thick.

Meanwhile stocks of iron ore at furnaces and Lake Erie docks were thinning out to a degree serious enough to promise ore-carrying crises for the remainder of the season. Estimates of ore consumption indicated that about 13,500,000 tons, or two months' supply would be left on hand May 1, assuming that ore ships would not be able to arrive before then. By May 1 of 1949, 9,367,579 tons of ore had been shipped.



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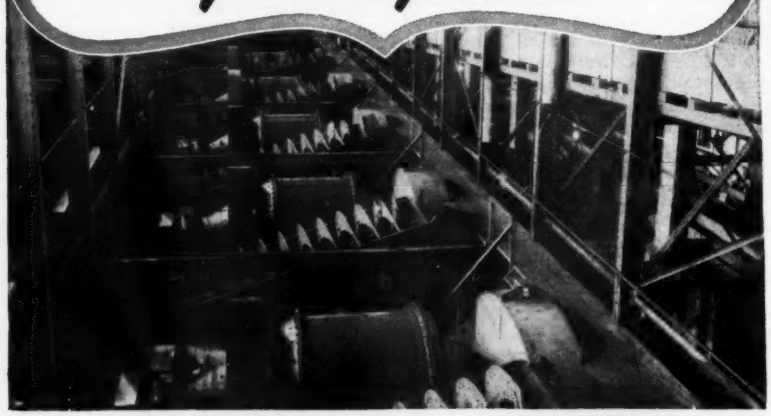
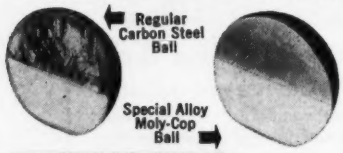


Quincy Mining Company's six 8 ft. x 6 ft. Hardinge Ball Mills on Torch Lake, Hancock, Mich.

Based on a 9 month test period ending June 30, 1949, the consumption of Sheffield Moly-Cop Balls was less than ⅓ as much as forged steel balls previously used by Quincy Mining Company in the six mills shown above. The forged steel balls were consumed at the rate of 1.55 pounds per ton of ore ground as against .49 lbs. of Sheffield Moly-Cop balls.

Actual cash savings were more than $30,000 in nine months, despite the original higher per-ton cost of Moly-Cop balls. The economy of Moly-Cop Balls has been proved in mining operations all over the world.

The harder martensitic structure of Moly-Cop Grinding Balls, their toughness right to the core, are the reasons for this longer grinding life and grinding economy. Your own ore-reduction costs can be reduced considerably, when you charge your mills with Moly-Cop Grinding Balls.



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Zinc Institute Meets

On April 11, members of the zinc industry gathered in St. Louis to attend the 32nd annual meeting of the American Zinc Institute. More than 250 representatives of domestic mining and smelting companies were present at the opening session. Dr. James Boyd, director, U. S. Bureau of Mines, speaking on Tuesday morning on the outlook for mining, stated that he could not present too optimistic a picture for the immediate future; but for the long-range viewpoint, he cited the increasing population of the United States and the expanding consumption of metals on a per capita basis as a reason for believing that undue pessimism was hardly warranted. He said that mining has been influenced to a high degree by political and economic events, many of which are of such a nature that the mining industry has relatively little influence in shaping them.

Pointing out the difficulties faced by the miners, Dr. Boyd declared: "It has become obvious to all but the most blind that our reserves have not been developed at the desired rate. The door is virtually closed for price support and production subsidies. The need for encouraging exploration must become more fully recognized. If the point is made clear to the Government and the public and not clouded by extraneous issues and the problems of individual operators, there is some hope for constructive action. This includes not only support of exploration for new and extended deposits, but also for technological improvements so that today's marginal ores will become the reserves of tomorrow."

Dr. Joseph Zimmerman, editor-in-chief of the Daily Metal Reporter, discussed the business outlook for metals which he said was good. Although endorsing the main objectives of the Marshall Plan and praising its achievements, Dr. Zimmerman remarked that some of its supplementary activities are likely to give the metal industry a business headache in years to come.

"What our Government is doing," declared Dr. Zimmerman, "is taxing the American public for the purpose of building up a competitive mining industry in foreign countries. Some of these countries may have rich ore resources. They certainly have cheap labor. The combination of these two factors will enable them to outsell us in the foreign markets, and undersell us in our own domestic market."

Dr. Zimmerman warned that after the ECA program ends in 1952, an American relief program may become necessary to aid those domestic industries that will be harmed by the competition offered by the Marshall Plan countries.

Developments in galvanizing from the production angle was the topic assigned to F. G. White, technical di-

rector, Granite City Steel Co., who traced the process of galvanizing sheets from the old hand-dipping methods to the machine coating process and then to the more recent development of continuous galvanizing in coils.

R. G. Kenly of the New Jersey Zinc Sales Co. discussed zinc in die castings and told how the per capita consumption of zinc die casting rose from one-quarter pound in 1926 to two and three-quarter pounds in 1949.

J. R. Freeman, Jr., of the American Brass Co., reported on the use of zinc in brass and cited changes in production methods and composition of brass products.

Senator George W. Malone of Nevada was the featured speaker of the meeting and spoke on the subject of "The Impact of Free Trade." The Senator's remarks followed a statement by Paul B. Jessup, Day Mines, Inc., who spoke of the problems of the domestic mining inustry in the face of foreign competition.

Howard I. Young, president, American Zinc, Lead and Smelting Co., and president of the American Mining Congress, spoke on the "Domestic Zinc Outlook." In depicting the future situation he stated "The zinc industry is now facing one of the most critical conditions it has had to face since the early stages of World War II. I refer to the supply of zinc concentrates from our domestic mines. Too often the importance of keeping the mining end of our business in a healthy condition is overlooked by those charged with the responsibility of selling and distributing our products.

"Increased labor, fuel, and sundry costs have made it impossible to continue the operation of a number of zinc mines in the United States."

Mr. Young anticipated lower average prices for zinc in 1950 and, under present lead prices, substantial reduction in zinc production during the last half of the year. He estimated that the total recoverable zinc produced in the United States during 1950 will not exceed 550,000 tons and will probably be nearer 525,000 tons.

To maintain the availability of zinc in close relation to demand, Mr. Young estimated that some 750,000 tons of foreign zinc concentrates must be imported in 1950. He pointed out that, while the flow of zinc from Canada might be expected to be normal, deliveries from Mexican mines might be curtailed because of disturbances there.

Mr. Young stressed the point that "new mine development in the United States is further retarded by our unfavorable tax and free trade government policies." This situation on top of the rising costs of production indicates "that before the end of 1950, both the domestic and foreign supply of zinc concentrates will be shrinking at a time when smelters need increased supplies."

At the annual meeting of the Board of Directors, Edward H. Snyder was reelected for a second term as president of the American Zinc Institute. Mr. Snyder is president of Combined Metals Reduction Co. Three vice-presidents were also reelected: Clarence Glass, Anaconda Sales Co.; George Mixter, U. S. Smelting Refining & Mining Co.; and Raymond F. Orr, Athletic Mining & Smelting Co. Erle V. Daveler, American Zinc, Lead and Smelting Co. was reelected treasurer and Ernest V. Gent continues as executive vice-president and secretary.

Directors elected for the term ending 1953 are: K. C. Brownell, American Smelting & Refining Co.; F. J. Childress, Mahutska Mining Co.; E. R. Dondorf, National Lead Co.; R. E. Dwyer, Anaconda Copper Mining Co.; Benno Elkan, National Zinc Co., Inc.; Andrew Fletcher, St. Joseph Lead Co.; Elmer Isern, Eagle-Picher Mining & Smelting Co.; G. H. LeFevre, U. S. Smelting Refining & Mining Co.; B. N. Zimmer, American Metal Co., Ltd.; and E. H. Snyder.

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Utah Fuel Sold

Henry J. Kaiser bought the Utah Fuel Co. on April 11 for $6,800,000. Only two bidders sought the stock. Bids made in the name of Minerals Development Corp. started at $6,650,000. The Book Cliffs Coal Corp., identified as a subsidiary of Kaiser Steel Co., bid $6,675,000. Minerals Development then bid $6,700,000 and Book Cliffs $6,725,000.

At this point the bidder for Minerals Development requested a week's delay to raise additional funds and stipulated that in event of default by Kaiser, his group would meet the latter's bid of $6,725,000. Then, the Kaiser offer was boosted to $6,800,000 with the warning that this bid would not hold good for a week if adjournment should be granted. At that point the stock was awarded to the Book Cliffs Coal Corp. subject to court approval.

Victory Mine to Close

Officials of the American Smelting and Refining Co. have announced that the Victory lead and zinc mine at Kokomo, Colo., is running out of ore and probably will be closed this spring. The Victory mine now employs about 60 men, most of them residents of Kokomo, a town with a population of less than 100. The Victory, with an average production of about 9000 tons of ore a month, was started in 1943 as a new mine, in ground underlying the older Lucky Strike property. It was sold to A. S. & R. the following year.

Gold Mill Burns

Fire completely destroyed the Montana Rainbow Mining Co.'s gold mill at Marysville, Mont., on April 2. Superintendent William Wade estimated the loss at about $150,000 in addition to nearly $85,000 worth of ore. The mill had been operating since late in 1945. Rebuilding is planned and mining operations will be continued.

Ray Expands Milling Facilities

The Ray Division, Kennecott Copper Corp., Ray, Ariz., reports that satisfactory progress is being made in the installation of new equipment that will give the company a treatment capacity of 15,000 tons of ore a day. This phase of the improvement program is scheduled for completion late in 1950. Included in the new equipment is a pit mine crushing plant at Ray, expansion of milling facilities and a new 10,000-kw turbo-generator at Hayden. Currently, the company is mining approximately 2500 tons of pit ore per operating day. This production is coming from tongues of ore which extend into the capping, and is in addition to the regular underground production. R. W. Thomas of Ray, is general manager.

Sunshine Installs New Pumps

New pumping facilities have been installed at the 1700 level station and at the 3100 level station to take over deep-level pumping at the Sunshine Mining Co. near Kellogg, Idaho.

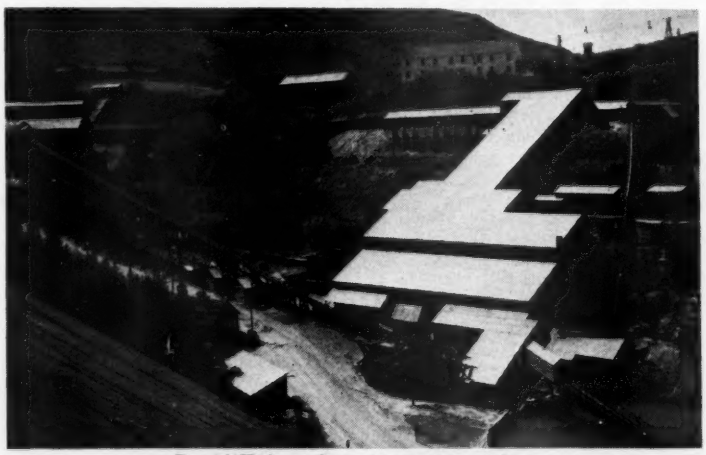
Until the latter part of 1948 the normal flow of water averaged about 180 gpm. When a water course was cut in the long Metropolitan south crosscut on the 3100-ft level, the flow was raised to about 230 or 240 gpm. The new pumps are eight-stage centrifugals, capable of delivering 350 gpm. Used in conjunction with one existing 200-gpm unit, they will increase pumping capacity from the Jewell shaft to about 550 gpm.

Magma Ups Efficiency

Magma Copper Co., Superior, Ariz., is continuing development work on the 3000-ft level in the far eastern section of the mine, and reports that chances are excellent for development of important ore bodies in that section at deeper levels. The average net cost of producing copper by Magma in 1949 was 17.94¢ a pound compared with 18.11¢ in 1948. According to the statement by A. J. McNab, president, the management expects a further improvement in efficiency of operations this year with no decrease in grade of ore mined.

U. S. Grant Opens El Fleda

The U. S. Grant Mining Co., Virginia City, Mont., is reported to have opened good gold ore in its El Fleda mine, 400 ft below the surface. The El Fleda has not been worked for many years. Recently a crosscut was driven 600 ft from the No. 1 level of the U. S. Grant mine to open it up. W. H. Myers, president and general manager of operations, reports his company is shipping four cars of gold ore weekly from the No. 3 level of the U. S. Grant mine.



Famed Utah producer to cease operations

Silver King Schedules Closure

On June 30, 1950, the historic Silver King mine at Park City, Utah, will close. According to an announcement from James Ivers, president, Silver King Coalition Mines Co., the closure results from economic conditions that make it impossible to operate the mine at a profit. Offers by the company, that meant a cut in wages but which would have made continued operations possible, were rejected by the union. Pumps are being pulled and the water level will rise to just under the 1300-ft level.

Central Eureka Reports Rich Vein

Stockholders of the Central Eureka Mining Co. of California, were recently told that a rich vein had been encountered on the 3900 level of its Sutter Creek mine and that the first ore milled had a high gold content.

The report stated "A cut sample across a four-foot space averaged 5.12 oz of gold or $179.20 a ton. It is believed that this high value may be localized enrichment, and stockholders are cautioned not to construe this as being the average value for the total tonnage that will develop on and above this level." The report added that previous experience on upper levels indicates a tonnage of 25,000-30,000 tons or about six months' maximum production that might be developed from this level.

Sullivan Extends Holdings

Through a 20-year lease and operating agreement with Metaline Mining and Leasing Co. the Sullivan Mining Co. of Wallace, Idaho, has extended its interests in the Metaline district to cover a major portion of one of the nation's most important zinc deposits.

Under the new agreement the Sullivan company will take over and operate the Metaline company's holdings and will undertake such development and exploration programs as it deems warranted. Profits from operation will be divided equally between the two companies.

Development and prospecting of the property of Metaline Contact Co., held under lease by Metaline Mining and Leasing Co., is also contemplated under the agreement. The river tunnel of the Metaline Mining and Leasing Co. will be extended 350 ft and a 600-ft raise will be driven to explore Contact ground. Operations under the agreement are expected to start soon.

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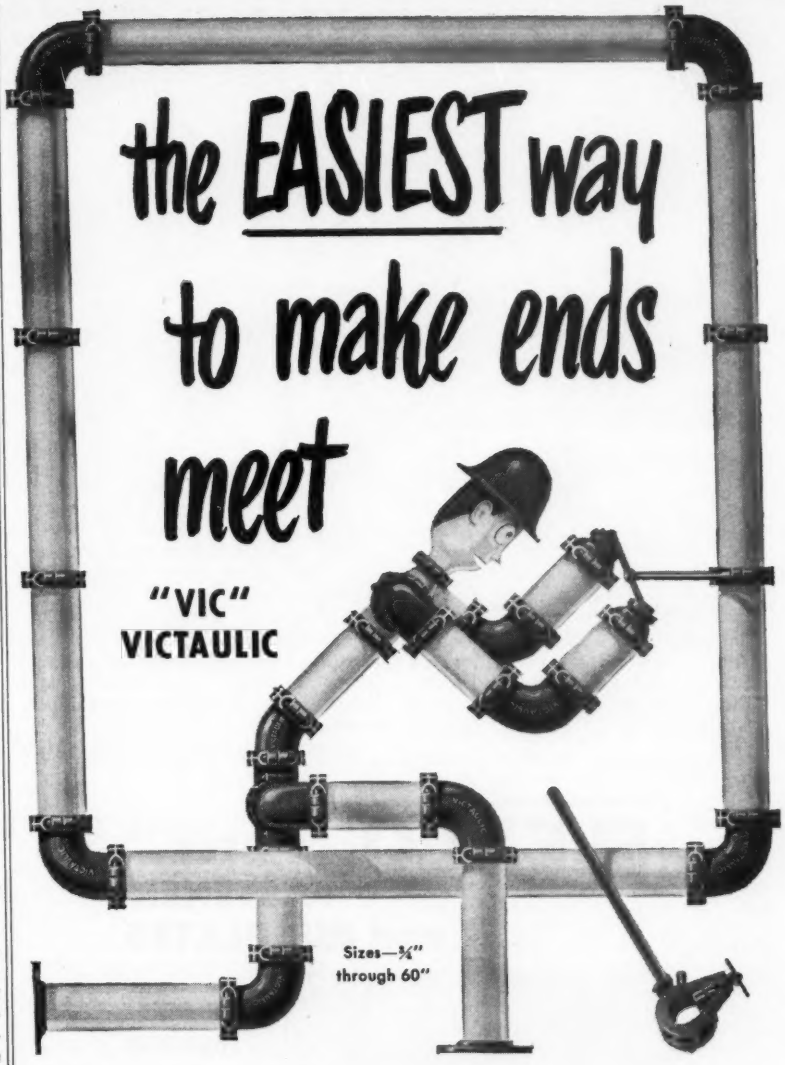

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Bonanza Lead Opens New Ore

A recent development in the Bonanza manto, near Colville, Wash., is reported to have been extended to a point 300 ft south of the stoping area of a year ago and has disclosed ore of a better grade and tonnage than heretofore uncovered, according to Norman D. Lindsley, chief engineer.

The new haulage crosscut being driven on the sixth level will speed extraction and transportation of ore. Expansion of the present 65-man crew is anticipated and a 500-ton sink-float flotation plant will be built to replace the present 100-ton mill. The new mill will be built on a site centrally located between the Bonanza mine and the Old Dominion mine, both of which are owned by the partnership of Earl B. Gibbs of Colville and Ira M. Hunley of Spokane.

During 1949 the Bonanza produced more than $500,000 worth of lead and silver, according to Mr. Gibbs. Mill heads for the 14,163 tons of ore milled, averaged 19.3 percent lead.

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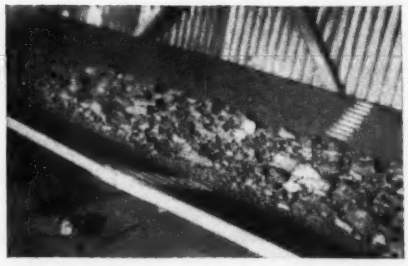

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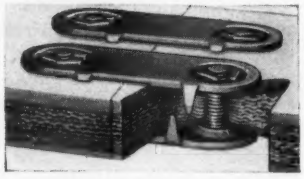

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Bunker Hill Halts Caving Project

The low prevailing metal prices have caused the Bunker Hill and Sullivan Mining and Concentrating Co. of the Coeur d'Alene district of Idaho to suspend operations on its block-caving project. More than 1000 tons of low-grade ore were being mined daily from the old upper workings before the work was halted.

BOOK REVIEW

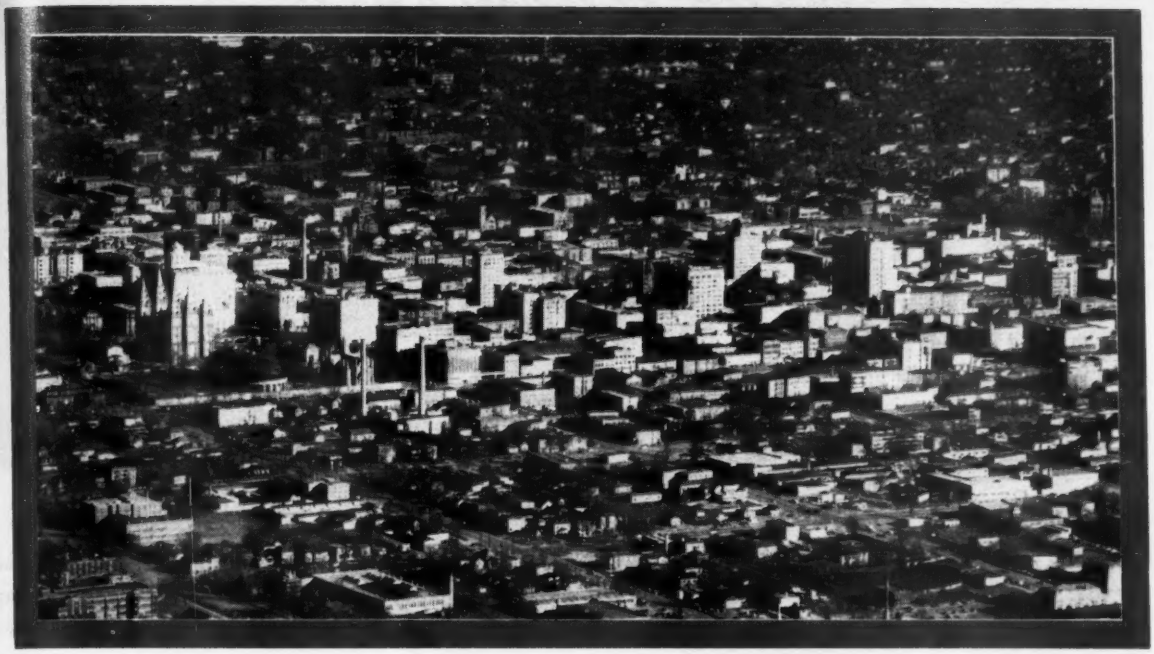
ORE GENESIS, *by John Stafford Brown, chief geologist, St. Joseph Lead Co., Hopewell Press, Hopewell, N. J.* 1948. 204 p.

Dr. Brown has given his book the subtitle "A Metallurgical Interpretation: An Alternative to the Hydrothermal Theory." In his analysis he discusses the outer crust of the earth and the primary ore deposits that occur there. The matter of sulphide ores is treated first in support of the metallurgical hypothesis as opposed to the theory of the "hydrothermal" origin of ore deposits.

Following a thorough discussion of the specific gravity and the paragenetic succession of sulphide ores, the melts from which they form, volatility and the zonal succession, vaporization of mixed sulphide melts, gangue minerals in the sulphide sequence, the process of ore emplacement, and water as a factor in ore formation, Dr. Brown presents case studies of sulphide ores occurring in the hypothermal, mesothermal and epithermal range. Throughout his text, Dr. Brown points out some of the inadequacies of the hydrothermal theory and its failure to apply in considering the genesis of specific ore deposits. Step by step he builds his argument to support the hypothesis "that ores were vaporized, chiefly as mineral substances, from horizons deep within the earth's crust, at which they had collected by various processes during the fusion of the encompassing rock materials." Facts presented by Dr. Brown support the contention that "The sequence is believed to be related directly to the specific gravity of the ore minerals and the lighter substances usually escape first."

After treating the broader implications of the metallurgical hypothesis, oxides in the mineral sequence, the silicate sequence and special problems including nickel and cobalt, manganese, chromium and platinum and other minerals, the author presents a chapter on further implications of the metallurgical hypothesis and zoning. The theory is applied to some controversial problems in the final chapter of this provocative book. There Dr. Brown discusses the Mississippi Valley mineral deposits, the Franklin, N. J., zinc deposits and the Bolivian tin deposits.

Dr. Brown's argument is a forceful one. Although the author points out the shortcomings of his logic in an epilogue, the ideas presented are valuable study material for every economic geologist.



Mid-Century Metal Mining Convention and Exposition at Salt Lake City

PLANS are developing for an outstanding 1950 Metal Mining Convention and Exposition, marking a half century of progress by the metal and nonmetallic mining industries. Under the leadership of D. D. Moffat, former vice-president and general manager of the Utah Copper division of the Kennecott Copper Corp. and now chairman of the Western Division of the American Mining Congress, a group of able men are arranging a meeting of surpassing interest to take place August 28-31 at the State Fair Grounds in Salt Lake City.

Late in May, the State Chairmen of the Program Committee, headed by General Chairman Roy A. Hardy, consulting engineer in charge, Getchell Mine, Inc., will meet in Salt Lake City to draw up a program highlighting the economic and legislative problems of mining, together with those operating topics and new developments of deepest interest to men specializing in every phase of production—from those responsible for putting rock in the box through the men who extract the valuable minerals from the ores. The many suggestions submitted will be of material help to this committee in selecting topics for discussion.

During Convention week the State Fair Grounds will be the scene of the most comprehensive display of metal mining and milling machinery and equipment that has ever been assembled for the interest of the mining industry. The exhibits of some 107 manufacturers will occupy 34,400 square feet of floor area—42 percent more than at the record-breaking 1948 Exposition in San Francisco. Leading manufacturers of the mining field are putting forth every effort to show the industry up-to-date developments for reducing operating costs through improved efficiency.

More than ever before, this biennial Exposition gives forward-looking mining men a splendid opportunity to investigate new developments, to consult with manufacturers' technical representatives, and to study and compare equipment and services in planning for the future. Those actively engaged in operating—superintendents, engineers, foremen, mill men, chief electricians, master mechanics, shift bosses, etc.—will have an exceptionally fine opportunity to profit from a thorough inspection of the exhibits, together with the discussions of operating problems by outstanding experts.

Following the four days of the Convention and Exposition, field trips will be made on September 1 and 2 to some of Utah's famous mining and metallurgical operations, including the world-famed operations of Kennecott's Utah Copper Division and U. S. Steel's new Geneva Plant. Also, on September 1, the Minerals Beneficiation Division of the American Institute of Mining and Metallurgical Engineers will hold sessions devoted to ore treatment methods, thus supplementing the papers on milling methods at the AMC Convention.

Registration will be handled in the same streamlined manner that worked so well at Spokane. Forms are being readied for distribution, requesting lists of those who will attend. Hand-lettered badges will be sent to advance registrants, who will be able to use the time normally spent in registering for more rewarding convention activities at Salt Lake City.

Make your room reservations now through the Housing Committee, care of the Convention and Tourist Bureau, Chamber of Commerce, Box 329, Salt Lake City. The week of August 28 will be an exceptionally busy one packed full of new ideas and information. Join the crowd in Salt Lake City to take an active part in the greatest mining gathering ever held in the West.

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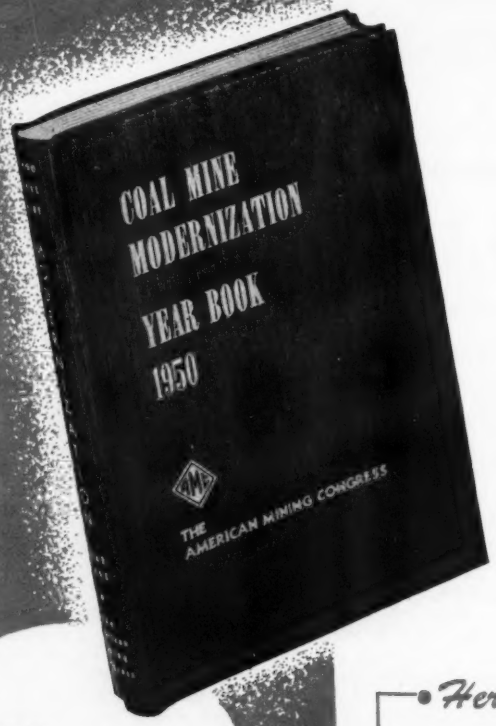
THE 1950 EDITION

COAL MINE MODERNIZATION YEAR BOOK



ALL the latest coal mining "know-how" is yours in this handy book containing the full proceedings of the 1950 Coal Convention. It's the work of more than 50 top-notch engineers and key operating men. It's crammed with time and money-saving ideas—tells you all the basic facts on new machines, new equipment, new methods—gives you the low-down on safe and efficient coal production and preparation.

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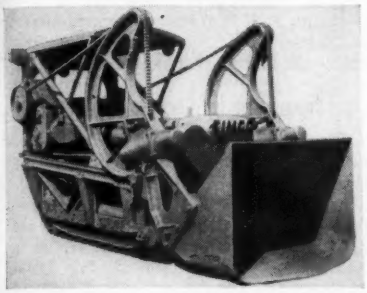
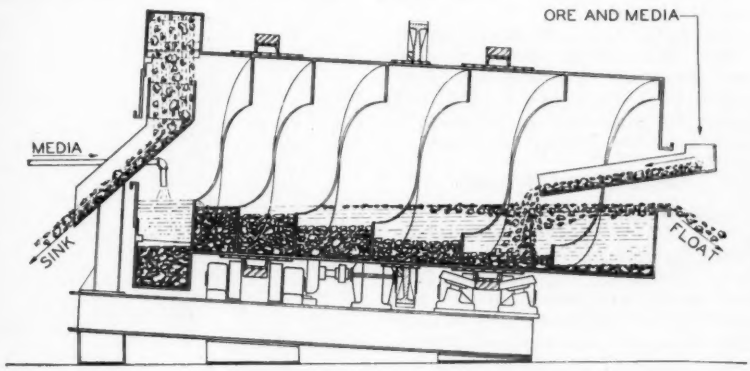


The Eimco Corp., Salt Lake City, has announced its new RockerShovel 104, a crawler unit powered by a 48-hp Diesel engine. It is said that the unit may be used for loading or bulldozing. Its straight backward and forward motion of the shovel eliminates the need of turning around to dump. The RockerShovel 104 is designed to dig and load blocky rock and abrasive ores in underground or surface operation. For heavy-duty rock loading the shovel is equipped with a 1¼-cu yd bucket.

Integral Bit and Drill Steel

A production drilling tool with tungsten carbide inserts placed directly in the upset end of the drill steel

is available from Black's Machine Shop, Bishop, Calif. This type of integral tungsten carbide bit and rod has been used with success in mines in the vicinity of Bishop.



Heavy-Media Separator

Hardinge Co., Inc., York, Pa. has entered the Heavy-Media ore beneficiation field with the introduction of a device, two of which are already in operation on the Mesabi Range of Minnesota. The Hardinge separator is a slowly-revolving, inclined, cylindrical drum with spiral flights attached to the inner surface of the cylinder. The material to be separated, accompanied by Heavy Media, is fed in at the lower end. As the drum rotates, the "sink" is carried by the spiral flights to the high end. The "float" overflows a circular weir at the lower end.

Extremely low maintenance is claimed for the unit as it has no internal moving parts to grind against each other. The manufacturer also says a smaller quantity of media is required and that the separator will handle pieces up to 4-in. size.

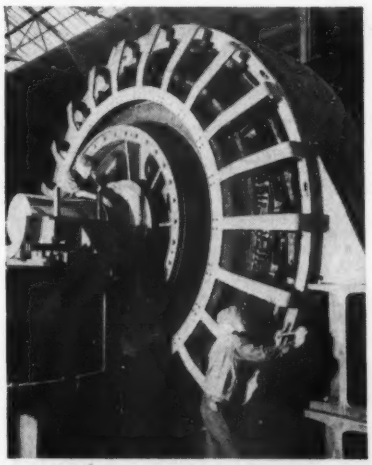
Coal-Mining Tools

Carboloy Co., Inc., Detroit, has announced production of auger bits and finger bits of an improved design. The improved auger drill bit was developed to increase ease of drilling and permit higher drill speeds. Faster cutting is said to be made possible by the use of larger clearance and relief angles. The new auger drill bits are available in 1¾-in., 2-in., and 2¼-in. diam. Finger bits for interchangeable use in strip or underground mining and other medium ground drilling are available in ½-in. size.

Largest Hoist Motor

The largest mine hoist motor in the United States, from the standpoint of physical size, has been shipped by General Electric to the Anaconda Copper Mining Co., Butte, Mont. The 600-v, d-c motor, rated 3000 hp at 60 rpm, will power an ore hoist at the Kelly shaft now being sunk as a part of the "Greater Butte Project" for the recovery of low grade copper ore by block caving.

According to GE engineers, the elec-

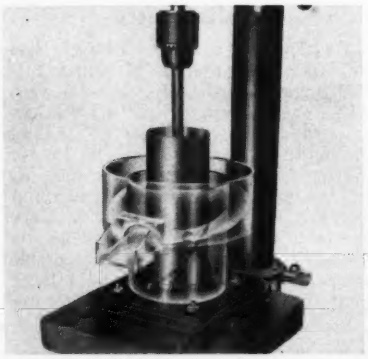


tric drive will be able to hoist 12 tons of ore per trip at the rate of almost half-a-mile a minute. Operating at full speed it will be able to complete a trip from a depth of 4335 ft in slightly more than two minutes.

Gravity Concentrator Uses Centrifugal Action

Designed to make separations in the size ranges below ¼ in., the Weinig concentrator, manufactured by the Colorado Iron Works Co., Denver, will be applied to low-grade Mesabi range ores in 1950.

Concentrating action takes place by means of centrifugal action when raw ore is fed into the center of the rotor and expelled through peripheral ports. The rotor is closed below the ports and the bottom third of the rotor comprises an air pocket in



which air is alternately compressed and expanded by the action of the rotor. An impeller at the bottom of the rotor diffuses the water to carry out the light constituents of the feed.

Economy in both the use of water and power is claimed for the new unit. High capacities are said to be obtainable in relation to the power and floor space requirements. The new concentrator will be offered commercially in combination with a dewatering unit consisting of a modified Akins classifier using a common pool level with the concentrator. A laboratory model is shown in the accompanying illustration.

Turbine-Powered Trucks

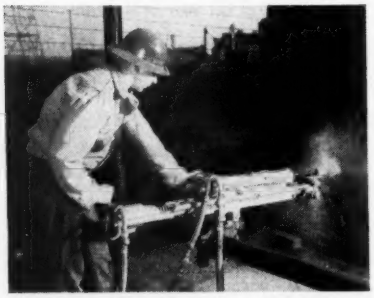
Preliminary road tests of the world's first gas turbine-powered truck, using

the experimental Boeing 175 hp, lightweight turbine have been completed. The 200-lb power plant was utilized in a ten-ton Kenworth Motor Truck Corp. chassis.

The new turbine-powered truck proved to be quieter than a conventional Diesel truck of equal power. Exhaust gasses are approximately the same temperature as those from a gasoline or Diesel truck. The turbine weighs approximately 2500 lb less than conventional engine installations of equal power.

Power Feed Drill Mounting

Three new "power feed" mountings for Thor drifter rock drills have been announced by the Independent Pneumatic Tool Co., Aurora, Ill. The units are equipped with sliding cones which are said to double the length of feed. The largest size, the Model RF-96, has a total extension of 96 in., 48 by means of the power feed and 48 by



means of the sliding cone. An aluminum shell provides the desirable light weight on the large size mounting. Other units provide feeds of 48 and 60 in., with the nominal feed providing half the extension and the sliding cone the balance.

All models are powered with an air motor. The "power feed" has been field tested for 18 months and is reported to result in improved drilling speed, new handling ease and sensitive control of the drilling operation.

Electric-Driven Compressor

Ingersoll-Rand Co. has announced a new line of heavy-duty electric-driven compressor in sizes ranging from 125-350 hp for continuous full-load service and two-stage compression to 80-125 psi discharge pressures. The XLE units are designed with a single vertical low-pressure compressor cylinder, a horizontal high-pressure cylinder, and a synchronous motor mounted directly on the crankshaft.

Featured in the design is the elimination of interstage piping by passing air through main air connections within the frame itself.

Heavy-Duty Coal Loader

Barber-Greene Co., Aurora, Ill., has announced production of a new heavy-duty coal loader designed to give flexibility in truck loading from stockpiles or storage bins. The hydraulically controlled unit has a road speed of 15 mph and is said to be easily maneuvered for rapid spotting.

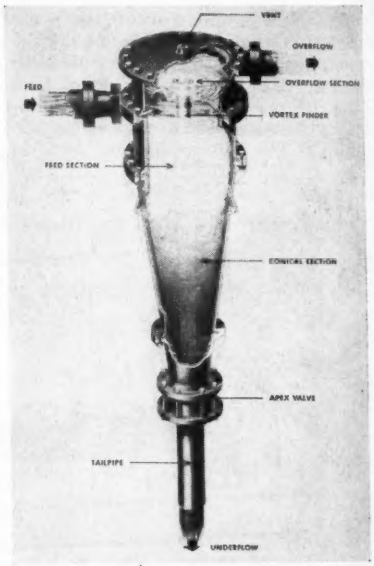
Wemco Consolidates Divisions

Harry N. How, president, Western Machinery Co., recently announced consolidation of the firm's Western-Knapp engineering division with its equipment manufacturing division into a new division to be known as the Wemco division. The newly formed Wemco division will manufacture and market Wemco products and design and/or construct metallurgical and mineral processing and beneficiation plants.

Ralph B. Utt, formerly general sales manager, has been named general manager of the Wemco division.

Separation by Centrifugal Force

The Dorr Company has acquired exclusive rights to the DorrClone and the DorrClone System in all fields other than Heavy Media operations, for the separation or classifying of finely divided solids suspended in a liquid. Previously termed the DSM Cyclone, the DorrClone was developed by the Dutch State Mines of Heerlen,



the Netherlands, and was originally used in coal washing plants in Limburg.

The DorrClone is a compact cylindroconical classification unit that utilizes centrifugal force to accomplish separation. The unit has a wide range of application including desliming, degritting, dewatering, classifying and thickening.

Detailed information on the DorrClone and DorrClone System may be obtained from the Dorr Company, Barry Place, Stamford, Conn.

— *Announcements* —

Robert H. Davies has been elected vice-president and acting general manager of the Baker Industrial Truck Division of the **Baker-Raulang Co.** Mr. Davies came to the company as manager of engineering from the Lockheed Aircraft Corp., where he had served as production engineer. At the same time announcement was made of the election of **Edward H. Remde** as vice-president. Mr. Remde has been with the company for 50 years.

Robert H. Davies

Paul M. Barlow has been appointed manager of sales and engineering of **C. B. Locke Co.**, Charleston, W. Va. **Cleve Meador** is now secretary-treasurer of the electrical equipment firm.

Edgar F. Guillot has been named assistant sales manager of **Filtration Engineers, Inc.**

Herman J. Daniels, formerly district manager for the Western Machinery Co., has formed the **Daniels Engineering Co.** located at Hazleton, Pa. **Richard D. Sandoe** is technical director of the firm specializing in heavy media and fines treatment plants.

H. Walter Regensburger has been appointed chief engineer of the general engineering department of **Link-Belt Co.** to succeed Harry L. Strube, retired.

James R. Russell, formerly explosives sales representative for **Atlas Powder Co.** in San Francisco, has been appointed a special representative in the New York district explosives department.

F. A. Miller has been appointed northeast regional manager of **Gould Storage Battery Corp.**, and **Al Janice** has been appointed to the post of New York district manager.

W. R. Hennessee has been appointed district manager for Indiana and Western Kentucky by the **Cardox Corp.**

James A. Cowan has been transferred to Pittsburgh, Pa., as direct factory representative for **Macwhyte Company**, wire rope manufacturers.

Kenneth Wernsing has been appointed a sales engineer for the **Skookum Block Co.**, manufacturers of mining and logging blocks and forgings.

Catalogs and Bulletins

BALL BEARINGS FOR CONVEYOR SYSTEMS. *New Departure, Division of General Motors Corp., Bristol, Conn.* Five distinct types of self-sealed and lubricated-for-life ball bearings designed for belt and trolley conveyors, foundry mold car wheels and similar applications are described in a new 16-page book. Numerous photographs of installations with performance records are included.

CONVEYOR BELT DATA. *Continental Gin Co., Birmingham 2, Ala.* A 64-page, well-illustrated catalog includes engineering and application data along with dimensions and list prices for many types of equipment used in conveyor belt installations. Idlers, pillow blocks, trippers, and magnetic and other types of pulleys are cataloged. Installation diagrams and a great amount of conveyor belt engineering data enhances the value of this comprehensive bulletin.

DRILLING TOOLS. *Central Mine Equipment Co., St. Louis 15, Mo.* A comprehensive 25-page catalog presenting the various combinations of coal master drilling tools for post and machine-mounted drills is available on request. The new catalog features tables that are completely cross-indexed to facilitate making up matched set assemblies for horizontal and vertical drilling in specific underground strip mine operations. Design features of augers, drill bits, drill heads, wedges, drill sockets and replacement parts and tools are described in detail in conjunction with drawings.

DEFLECTING DIAMOND DRILL HOLES. *E. J. Longyear Co., Minneapolis 2, Minn.* A 28-page booklet containing 14 charts and precise instructions for deflecting drill holes has recently been published. Methods of using the improved Hall-Row Deflecting Wedge are described in detail. The subject is practically treated and is based upon Longyear experience in the field.

INDUCTION MOTORS. *Electric Machinery Mfg. Co., Minneapolis, Minn.* The ABC of large induction motors, a special 32-page booklet covers the basic theory, operation, characteristics and applications, and control of large induction motors. It presents a comprehensive, practical treatment of squirrel-cage and wound rotor motors. Copies may be obtained upon request.

LUBRICATING MINING AND MILLING EQUPMENT. *E. F. Houghton & Co., Philadelphia.* Lubrication recommendations for all types of mine power, breaker, stripper, loading, hauling, milling, and drilling equipment are listed.

PORTABLE CRUSHING AND SCREENING. *Crusher Division, Nordberg Mfg. Co., Milwaukee 7.* An interesting brochure entitled "Symons Cone Crushers and Symons Vibrating Screens in Portable and Semi-Portable Plants," contains flow sheets and tables showing arrangements, horsepower requirements and conveyor, screen and crusher specifications for various hourly production capacities. Many drawings cover suggestions for arranging equipment to make up plants incorporating this equipment.

ORE PROCESSING MACHINERY. *Nordberg Manufacturing Co., Milwaukee 7, Wis.* Two new bulletins of crusher and process machinery have recently been published by the company. Bulletin No. 149, is an 8-page pamphlet describing and illustrating 21 different machines manufactured by the crusher and process machinery divisions of the company. Bulletin No. 152 is a 4-page pamphlet presenting details of the advantages and special design features of the Nordberg grinding mills of the ball, pebble, rod, tube, and compartment types. Copies may be had upon request.

SHUTTLE CAR OPERATION. *The Gould Storage Battery Corp., Trenton, N. J.* A 12-page bulletin entitled "A Report of Mine Shuttle Car Operation" is available on request. Data presented is based on 95 time studies by engineers in the mining division of Pennsylvania State College and supplements information presented in the bulletin entitled "More Profit in Mechanized Mining," available from the Mineral Industries Experiment Station, State College, Pa., at $3 per copy.

Tables of field data are included in the bulletin on shuttle car operation and show ways in which battery cars are reported to give superior performance over cable cars. The second section of the booklet includes safety advantages in many important performance advantages resulting from the use of battery power which permits shuttle cars to operate as independent units. Cost summaries are included that show the use of battery-powered cars saves four-tenths of a cent on every ton mined.

SMELTING EQUIPMENT. *The Mace Co., Denver 5, Colo.* Mace smelters and accessory smelting and refining equipment are described in a general catalog including information on the processes involved in the reduction of nonferrous ores, concentrates, and secondary metals. The products of the company are especially designed and adapted to smelting ores and concentrates on the production site with small unit smelters.

SPECIAL ALLOY STEEL. *Jones & Laughlin Steel Corp., Pittsburgh 30, Pa.* A 36-page brochure, "For Longer Wear, Less Repair," describes Jalloy, a special alloy steel which is capable of being heat-treated to excellent physical properties. The alloy is used where brasion and impact resistance are major factors in the service life of steel. The booklet features a complete presentation of case histories of the use of Jalloy in various fields as well as complete technical data on this special alloy.

TESTING, ENGINEERING, DESIGN, AND CONSTRUCTION. *Southwestern Engineering Co., Los Angeles.* The factory and services of the company are presented pictorially and described in a 12-page leaflet. One section is devoted to photographs and a concise description of processing plants designed and constructed by the company.

VACUUM FILTRATION. *Filtration Engineers, Inc., Newark 4, N. J.* The 24-page bulletin outlines the principles of continuous rotary vacuum filtration and gives technical details of the FEinc rotary vacuum filter with string discharge, and shows how this filter speeds the continuous process of many industries.

WET GRINDING. *Hardinge Company, Inc., York, Pa.* In a new, condensed bulletin, conical mills, convex head cylindrical mills, rod mills, and related equipment are covered. Operating data and flow sheets are presented that are of value to mill operators.

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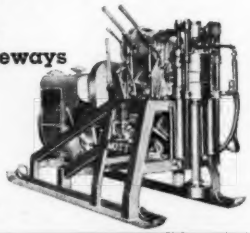

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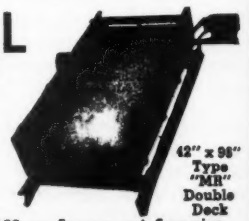

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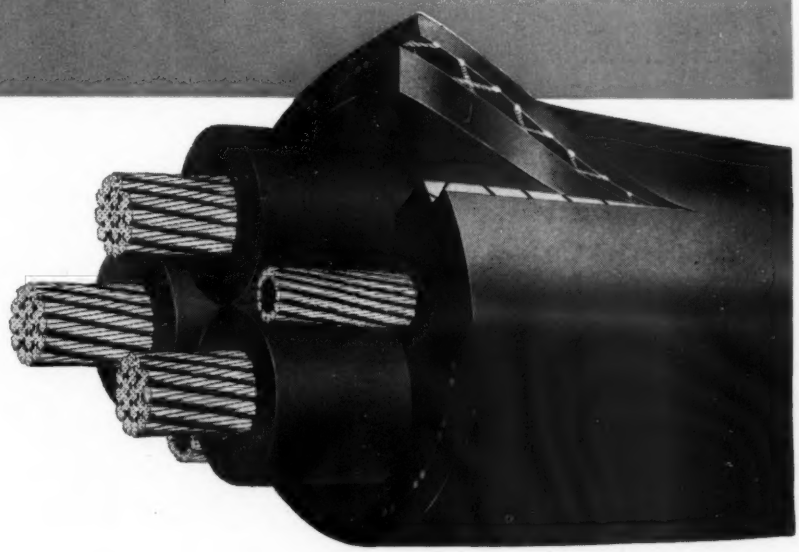

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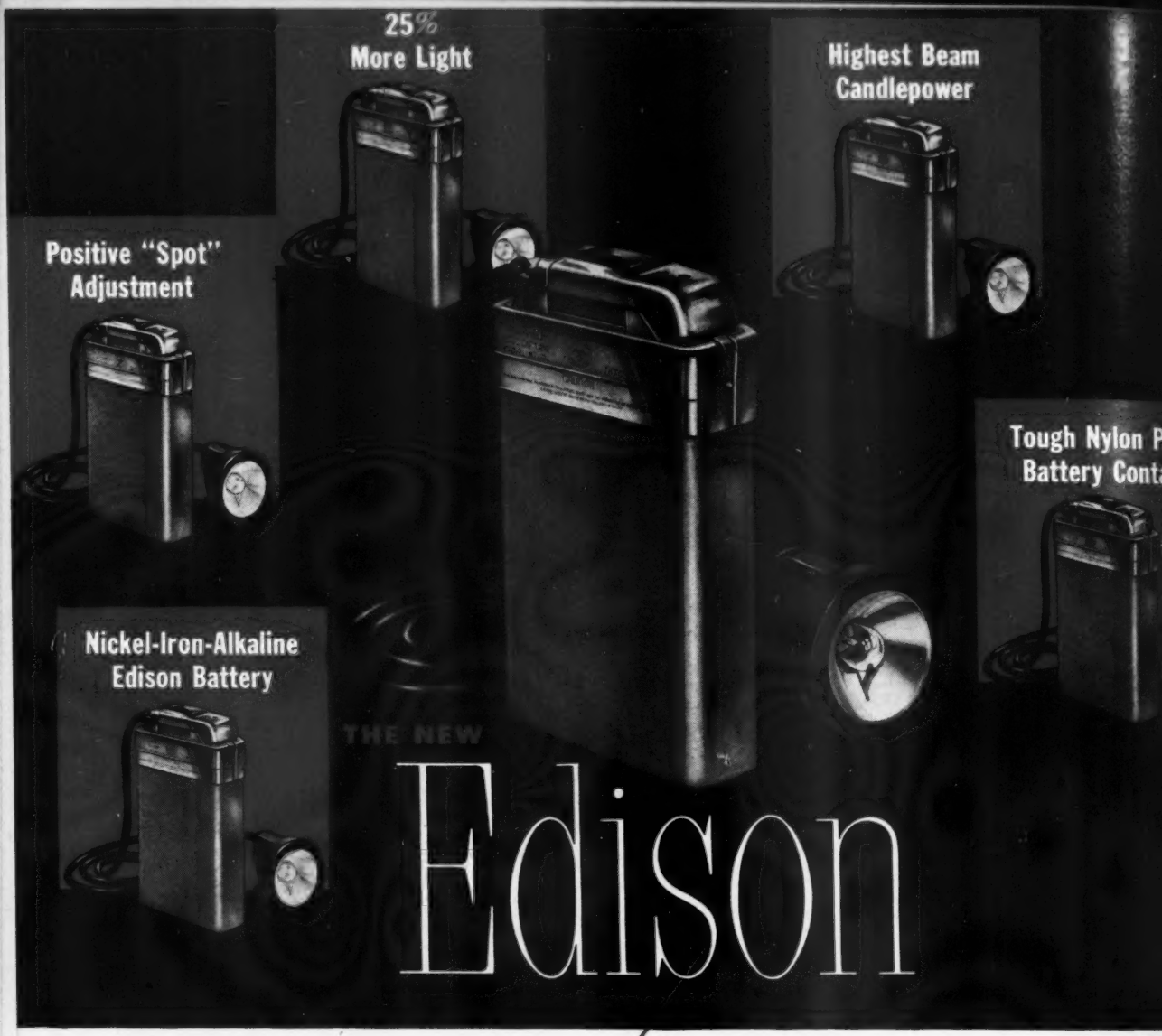

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